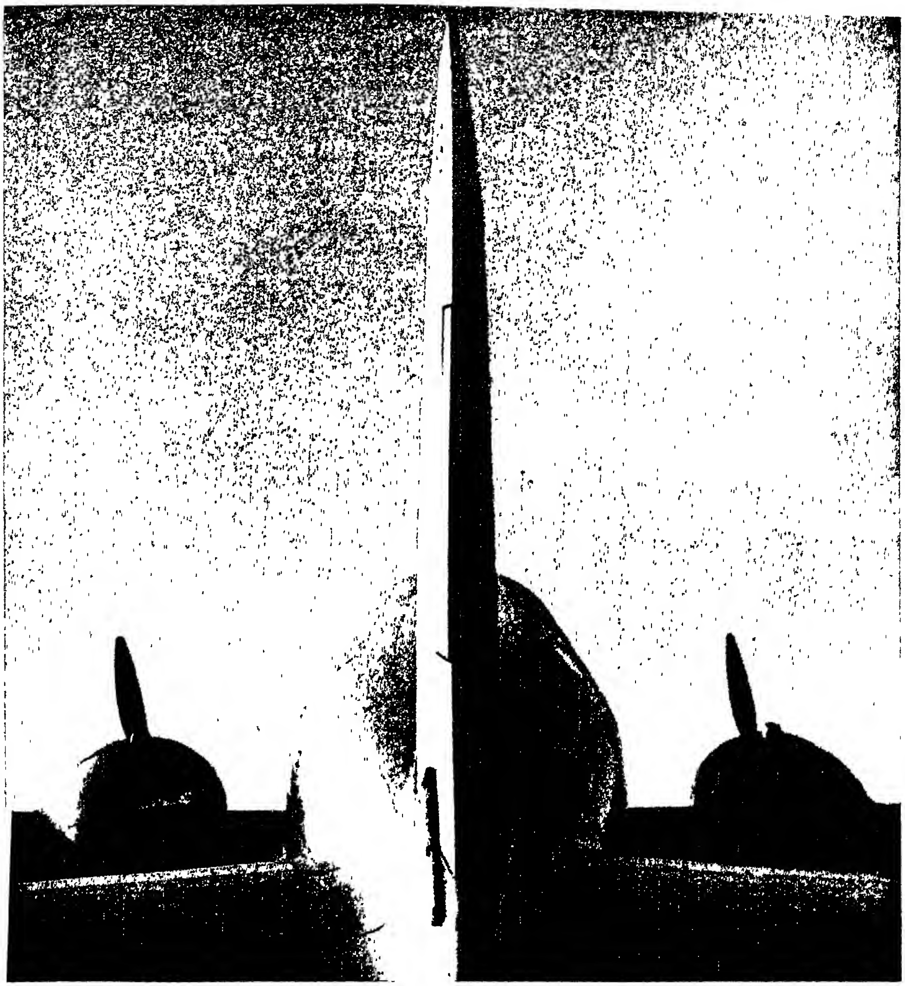
ART AND THE MACHINE

"We should be more efficient, Sir, if less decorated."

A Persian general to his emperor, fifth cen

The American while adhering closely to his utilitarian and economical principles, has ι in some objects to which his heart equally with his hand has been devoted, developed a beauty in them that no other nation equals. His clipper-ships, fire-engines, locomotives, a his machinery and tools combine that equilibrium of lines, proportions, and masses, whicl the fundamental causes of abstract beauty. Their success in producing broad general effec few simple elements, and of admirable adaptations of means to ends, as nature evolves bea the common and practical, covers these things with a certain atmosphere of poetry, and is tion of what may happen to the rest of his work when he puts into it an equal amount ol knowledge.

James Jackson Jarvis



Sources of idioms of machine-age art: streamline, long hard edge, sheer surface, and repetition of simple motives, as seen in an airplane. (Photograph by Dmitri Kessel, from *U. S. Camera 1936*.)

ART AND THE MACHINE

An Account of Industrial Design in 20th-century America

by

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and

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PREFACE

THIS book is the result of an intensive study of industrial design. Behind the immediate research there lies a long-time interest on the part of both authors in the direction of art evolution in the modern world, with special emphasis on the machine as influence.

Obviously there is a new art, existent in machine-made mass products: industrial design. It is not an esoteric and precious manifestation but a practical expression embodied in utilitarian forms increasingly familiar in the daily life of the average person. Everywhere it condemns the standards of taste by which we formerly chose our furnishings and our "ornaments" and foreshadows a new universal style. But the manifestation is so new that there has been hardly an effort to evaluate it, to trace its origins, or to fix its boundaries. Within the decade neither the new artist profession nor the new artist product had been named. "Industrial design" was a term without specific meaning.

As an instance of the newness and the confusion, even in centers of authority, we may note that the current edition of the *Encyclopaedia Britannica* has no entry under the title "Industrial Design," nor any reference to the machine and mechanics as factors influencing design except in a paragraph appended to the article on "Arts and Crafts." One still encounters great museums encouraging industrialists to copy craftsmen's ornamental motifs to render the machine or its products "artistic," and leading art schools teaching that two-dimensional design in advertising and "styling" *is* industrial design.

We found the necessity for clarifying at the outset this one fundamental principle: industrial design is rightly determined by and geared to industry as it is. The machine is the foundation fact as well as the shaping tool; is influence and inspiration. Much of the confusion of authorities and

e public alike seemed to arise from the failure to recognize industrial
:sign as a new form of art separate from that of the manual age, produced
' separate forces in accordance with a new aesthetic.

Certain questions were everywhere encountered, with no conclusive swers available from any source. Commonest among them were these: there any survival value in crafts ornament such as was borrowed and aped to machines and their products in the nineteenth century, and such as : still have with us in a thousand forms? Or, if all ornament is to be sheared ' and a new start made, is the abstract, cold "rationalist" design we were first nscious of in German architecture and interiors the alternative? Then where es art come in? Can the inventive engineer's solution in functional form er properly yield aesthetic values; or does his product emerge as art only en functional form is subjected to the same processes, subjective and uitional in character, which produce painting and sculpture?

Beyond all these, there were other questions for which we had to look answers in history as well as in machine-shop practice. What, for instance, tinguishes industrial design from the group of professions which are itimately descended from the fine handicrafts and still practiced as "the :orative arts"? And if motifs and toolmarks from the traditional arts and fts are going to appear increasingly out of place in a world where the chine is universally the tool of execution, are there any historical handicraft als or traditional handicraft practices that may properly persist? Will handicrafts survive as small and special industries, or as a form of recrea- ı to be pursued in the ever increasing machine-age leisure? Or is their :ory at an end?

Such conclusions as we have arrived at are presented primarily with average person in mind. It was this average person, the "ultimate con- ıer," who first made known to industry his growing dissatisfaction with old drab and stereotyped appearance of useful commodities of all

kinds, and thus inspired the activities which yielded industrial design. Today, he is intensely conscious that there is a new machine-age style, but is often very much bewildered as to the laws governing its expression. Since nothing but his discriminating demands for higher and higher standards will conclusively establish the new practice, our primary intention is to create an awareness on his part of what industrial-design values are. If we can do this in only a few instances, by statement, by reiteration, and by reference to products judged representative of the best the industrial designers are producing, he will go on using his own discrimination, finding repeated indefinitely, through successively widened ranges of restudied appearance values, the same marks of a machine-age style.

We have kept the student also in mind. As we have talked with young people studying in the routine courses of engineering and architectural colleges or in art schools, we have found a lively conviction that industrial design is to be the most vital expression, in terms of the arts, of a new age. Further evidences of this student interest are given by some of the most prominent industrial designers, who report receiving a half-dozen letters a day from young people all over the country asking how to prepare themselves for the profession. Young men—some young women—see the promise of a long-lost unity of art and practical life about to be restored. One of them said with great earnestness: "Artists are no longer to sit on the doorsteps of life, taking whatever patronage is grudgingly given them for their useless wares. They are going to be at work where foundations of a new kind of everyday life are being laid." And yet, with few exceptions, there is still no effort to provide adequate guidance, either in books or in schools.

If we can adequately define industrial design to show it free of the corrupting currents that flow on from handicraft sources into machine-craft training and practice, noting the true springs of the new inspiration, which we believe we have found in the now almost miraculous powers of the machine

nd in modern abstract art, we feel that some practical gain will have been ıade for the public and the student. In the process, the nature of the in-ustrial designer's undertaking and his contribution, as it appears in the erspective of recent art history and the nineteenth-century industrial revolu-on, are shown, as are the attitudes and the reactions of the industrialist to ıe artist who has come to the factory to do his work.

Our study is limited to the American scene, but by no means out of spirit of narrow nationalism. We are quite aware that the *tendency* toward omplete industrialization is world-wide, and that thought is being given appearance values of industrial products in many countries. But closer udy fails to reveal that there is an international movement into which the ractices and the products we are studying can be made to fit. The extent of merican reliance upon mechanized industry and of the use of machinery everyday life has no parallel in other countries; the same economic laws o not operate in Sweden or France or Russia, or to the same degree in esent-day Germany. Industry and its art are historically and divergently ifferent in Europe, as are the psychologies underlying the diversified evelopment. We accept only partially, for instance, as applying in America, Ierbert Read's judgment of reasons for the retarded progress in England ecorded in *Art and Industry,* which is perhaps the most widely circulated ook on industrial-design backgrounds yet to appear). He says: "The llacy underlying the whole movement is by no means yet fully exposed. the minds of our manufacturers, underlying the activities of our art schools, still the supposition that art is something distinct from the processes of e machine, something which must be applied to the manufactured object." e propose to show that American manufacturers are intensely alive to dustrial-design values, though it is true that here as there the educators are general thinking of the world of the machine and the world of art as parate realms.

Herbert Read recently recorded elsewhere the opinion that "the more mechanical the world becomes (not only the visible world but the actual process of living) the less spiritual satisfaction there is to be found in the appearance of the world." We believe, on the contrary, that we have seen the beginnings of a new and truly creative art and the foundation of a new national and international culture which is a product of the mechanized world and rich in spiritual resources. The cultural implications are to be realized to the extent that more complete industrialization comes about with the artist's collaboration.

We have tried to present a practical view of the alliance of artist and machine, and of the results up to this time, together with a tentative aesthetic governing them. We have almost wholly eliminated experimental and imaginative projects from the illustrations, and have curbed the impulse to present an exciting visualization of a future environment transformed by artist-designed products. We nevertheless hope to have retained enough of the prophetic and inspired picture brought away from the studios of some of today's most practical artists to enable us to share with the reader our confidence that we are at the beginning of a new world of appearances, beautiful with the peculiar beauty of the machine.

Sheldon Cheney.
Martha Candler Cheney.

Old Greenwich, Conn.
November, 1936.

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1. INDUSTRIAL DESIGN EMERGES

INDUSTRIAL design is the artist's contribution to mass products in the three-dimensional field. Primarily it is engineering design which the artist has endowed with appearance values that are susceptible of aesthetic judgment. As a new profession industrial design came into existence about a decade ago in response to widespread demands for a new order of beauty in useful commodities. Automobiles, electrical appliances for home and office use, the kitchen sink, the hot-water furnace, the adding machine: these are among characteristic industrial-design products. There are a thousand familiar devices and gadgets that are equally appropriate examples.

Industrial design is most characteristically evident in objects that are new in the machine age, or that have not hitherto been thought of as appropriate subjects for artist attention. But the prevailing principle that the mechanical facts of construction and of use are the basis for the new appearance values is rapidly being adopted for commodities of all kinds as mass produced by factory machines. Even the former "decorative arts" industries, notably furniture making and interior decoration, are being submitted progressively (wherever now widely recognized standards of Modernism are accepted) to this basic requirement that design is not applied, but is brought out.

The fundamental principles of the new practice are the same as those underlying all valid art expressions of the past while they are still at the primitive stage, and relate machine-age art to earlier phases. The new worker comes in the dual role of artist-artificer. The materials and the processes, and the use to be made of the thing designed, determine the character. Thus it was when the immemorial nameless artists first gave form to the little pots of Crete, or the Scythian bridle bits, or the rude stone arch at a wayside shrine

in medieval Europe; thus it is as the twentieth century's machine-age designer who works truly in the spirit of his own time gives appearance values to the streamline train, the kitchen spoon, the electric sweeper.

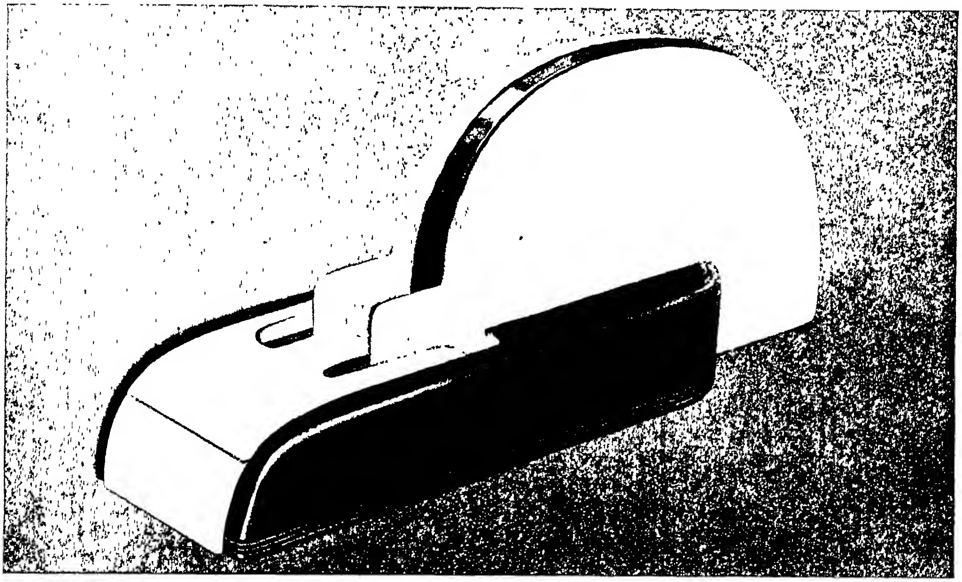
Old principles universally applicable are at work under new conditions, that is all. Crude means and primitive stuffs; the elemental tools and the stone, wood, and clay have given place to machine-age materials and instruments. Where once a single thing was made unique and precious and stamped with the mark of the artist's personality, today's requirement is for impersonality, objectivity. A million copies of one design may be produced with the necessity that the last shall be as perfect in efficiency and appearance as the first.

But the industrial designer's credo is the antithesis of what was widely and generally accepted by nineteenth-century manufacturers as basic to "industrial art." It is derived from sources independent of applied design, as the term is still widely employed throughout centers of industry and merchandising. The new figure sees all past effort to adorn the still crude machines and their often cruder output as representing a misunderstanding of what art essentially is and as a falsification of machine function. Two-dimensional art is not properly applied to three-dimensional products in the industrial-design field. This means that the industrial designer's practice has as little in common with that of his contemporaries in such fields as illustration and fashion design as it has with periods and traditional styles.

It is the purpose of this book to offer an aesthetic canon for industrial design, to show:

1. That American engineering was one of the two streams of influence that flowed together to produce industrial design, abstract art the other.

2. That the industrial designer's product (as now familiar to everyone in a wide range of everyday commodities) is a twentieth-century craftsmanship as valid for useful objects of our age as was the fine handicraft that pre-



Two typical examples of simplification, with abstract values replacing ornamentation. Above, salt and pepper set by William Lescaze, for Revere Copper and Brass Company; below, design by Ferar and Sundberg for a gummed-paper moistener.

vailed in the furnishings and accessories of late seventeenth-century England.

3. That industrial design is part of a wider three-dimensional expression now apparent in many fields, representing everywhere the work of the artist-technologist; the product everywhere of the same principles, with the same style marks.

Useful, everyday products are adduced in evidence of a new world style emergent, of a new art destined to become as expressive of the economic and cultural life that produced it as was the art of the Greek or the Gothic age. No other period could have produced the particular kind of beauty which we are beginning to see as the primitive expression of the new thing. It could have come out of no other kind of order. It comes now where technological refinement evolves in factory centers to a stage of producing its own basic rightness of design; then creative artists take this engineering rightness as starting point for their contribution, which is aesthetic rightness.

Accepted thus as a living art of the day, most prevalent in things of greatest usefulness, industrial design begins to appear as a source of satisfaction and enrichment, potentially contributing to an organic culture such as the Western world has not known for several centuries. Art and life were violently wrenched apart by the hierarchy of science and industrialization. It is with a sense of wonder that we begin to see them united again at a higher level by the same forces, for ends not yet completely manifest. There is a challenge to the average person to become an adventurer among the creative values of his own age, as any shopper or consumer or mere spectator may; and to find the marks of a potentially great future art in the mechanical refrigerator, the reading lamp, the vacuum cleaner, the comptometer, and the check writer, as well as in the automobile, the airplane, and the skyscraper. Everywhere, there is to be found merchandise to be distinguished by the beauty that is peculiarly a product of artist and machine working together.

But because industrialists, merchandisers, and a large part of the public are not yet sensitive to the values which give character to industrial-design products (which relate them to all validly designed things of a new age) there is much confusion everywhere between old, two-dimensional applied design and new built-in, three-dimensional design—between appearance design that is decoration and appearance design that is engineering. Industrial designers themselves are responsible for work that is good and work that is bad; and there are compromisers, apologists, and experimenters here as in any other new and promiseful profession. There are men and women glibly using the modern idioms to produce a surface imitation of contemporary Modernism, just as there were formerly imitators of the valid period styles and of handicraft products for the machine's cheapest reproductions.

In this field, as elsewhere, the artist's contribution is an unanalyzable quality which makes its appeal to taste and discrimination. It is only possible in any presentation of the subject to analyze the principles involved and call attention to the industrial requirements for their use. But the eye that is sensitive quickly detects the quality of distinction which is the artist's contribution, and begins to watch for its reiteration throughout the range of machine-art products—and in the wider cycles of the daily environment. The principal illustrations in this book have been collected and arranged as the most useful means to this end. They are presented according to categories of uses. Where the artist is judged to have been particularly successful in carrying through to a triumphant and original aesthetic expression, this fact is noted, with instances also of solutions that fail to emerge as valid industrial design.

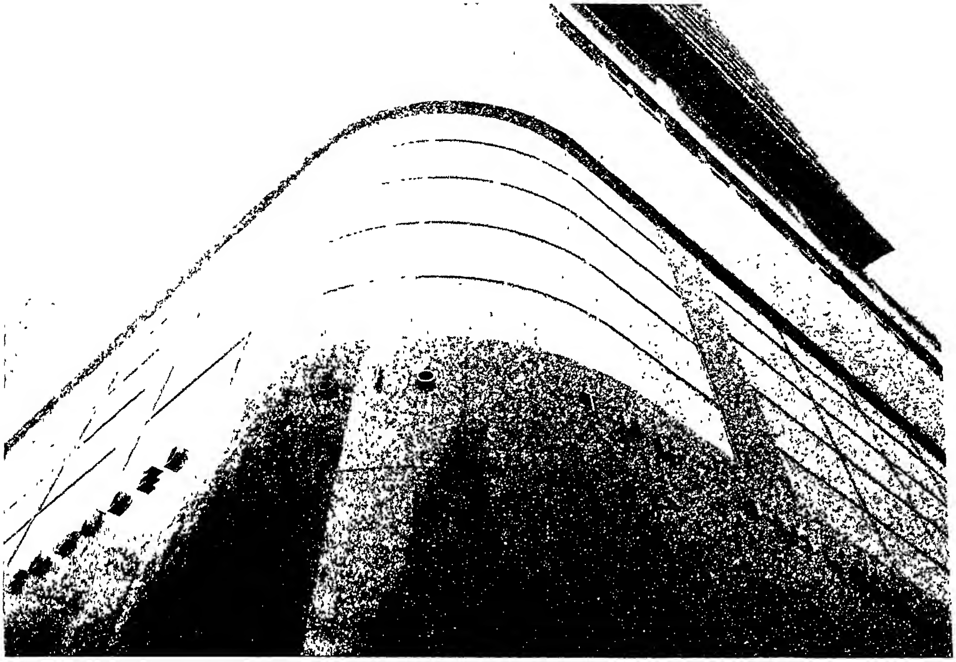
The public was responsible for the emergence of this new commodity art. An unmistakable demand for higher standards of appearance resulted, in 1927, in the artist's being summoned to the factory for service in unfamiliar design fields. It was not coincidence that, in that year, spiral springs

and compensating gears and even common screws were assembled and exhibited in an art gallery, as one evidence of a growing awareness of the design character in certain machines and machine parts and machine products, where not tradition but function alone determined form. There was a spreading machine-age consciousness.

This was, of course, a time of great confusion in industry. Even during a period of extraordinary general prosperity, there had been the disquieting symptoms of overproduction, inactive markets and, consequently, a progressively increased volume of manufactured goods in relation to employed workers. Manufacturing interests were forced to make far-reaching appraisals of production methods and means and of consumption statistics, and to seek ways of restoring the old happy balance.

Industrial research, already well organized, was concentrated on the problem with results so striking that it has been termed in England "the scholarship within American business comparable with the scholarship within British politics." The substance of the findings provided the basis for today's industrial-design practice, as exemplified in the five-and-ten-cent store's reconsidered merchandise and in the latest streamline train. It is embodied in the now familiar maxim of all merchandising that, beyond a certain practical efficiency, the appearance of the product determines its acceptability to the public. In other words, American industry was forced, through the greatest economic emergency of its history, to a recognition of the necessity of beauty, not alone in traditional art-using fields or fields where style and design had applied, but in all kinds of commodities mass produced by the machine.

The mass production and marketing revolution which immediately started belongs to the still unwritten history of industrial economics. New professions and new techniques in old professions resulted, but in order to show how the way was opened for the emergence of today's industrial



The machine element determining appearance in the new architecture. Philadelphia Savings Fund Society Building. Howe and Lescaze, architects.

designer, the artist-technologist working in three-dimensional terms, it is necessary only to glance at two phases of the activities: the particular cause-and-effect sequence which preceded the emergence of industrial design as we now know it, and the wave of imported "modernistic" fashion activity which overlaid and confused the earliest industrial-design efforts and delayed development of the profession.

Smartly styled modern-art advertising emerged. It was followed presently by the closely related new professions created to infuse some of the color and style of the advertising layout into packaging and labeling for the merchandise. Creative window displays achieved a distinction which made them front-page copy. The merchandise displays were staged and dramatized by the best experts available in America, or even brought from Europe for the purpose. Large stores redesigned one department after another, and sometimes whole interiors, and little shops became as bright and attention-provoking as the costume jewelry and perfume bottles in their windows.

That was the stage at which some of the present-day industrial designers, though unknown by the name, were engaged by the new "style and design" directors of major department stores to walk through the stores and make recommendations for improving the appearance of all kinds of commodities. Other artists now engaged in the profession were also at work at various stages of the tremendous merchandise effort, in advertising, package and label designing, window-display making, or, to use a term which gained currency in design laboratories in the earliest days, "face lifting" merchandise products. But the spectacle of the creative artist wandering through miles of store aisles with his steadily lengthening *index expurgatorius* marks a significant moment. From his point of view everything was wrong. His artist judgment rejected the store approach as being made too far from where design begins. Thus his mind was turned to the factory and its experimental laboratories and away from the display rooms.

Thus, what was conceived first as "eye appeal," then superficially as display value, passed gradually to the conception of basic rightness of appearance in staple commodities, a quality to be built into whatever the factory produces, most thoughtfully where there had been before no style and design standard. The artist, ready to add a functional, modern-art value to engineering design, saw that he must get back to the conferences at which industrialists adopt specific patterns for new wares, before expensive retooling processes have been introduced and perhaps even new kinds of workers trained for the jobs.

Simultaneously and merging at many points with this stream of effort came an almost unprecedented influx of European fashions in merchandise of many sorts. America was introduced in the process to that shallow but seductive thing called *art moderne,* which became a source of much confusion. It was brought from Paris out of the 1925 Exposition of Decorative Arts and capitalized by metropolitan department stores and museums. The exposition was a sort of focus of advanced decorative styles of continental Europe, but with a strain of the superficial catchiness of the *art nouveau* of twenty years earlier. American buyers, architects, and fashion artists came back filled with enthusiasm, exotic color, and a few easily applied surface motifs, ready to give their country its share of modernistic smartness. If the machine had by way of the Vienna Secession contributed a sheer-wall and hard-edge simplicity, it was in Paris softened with rounded corners, bits of neobaroque ornament, and perfume-like coloring. The French were still consciously "decorating." They were exploiting a modish smartness.

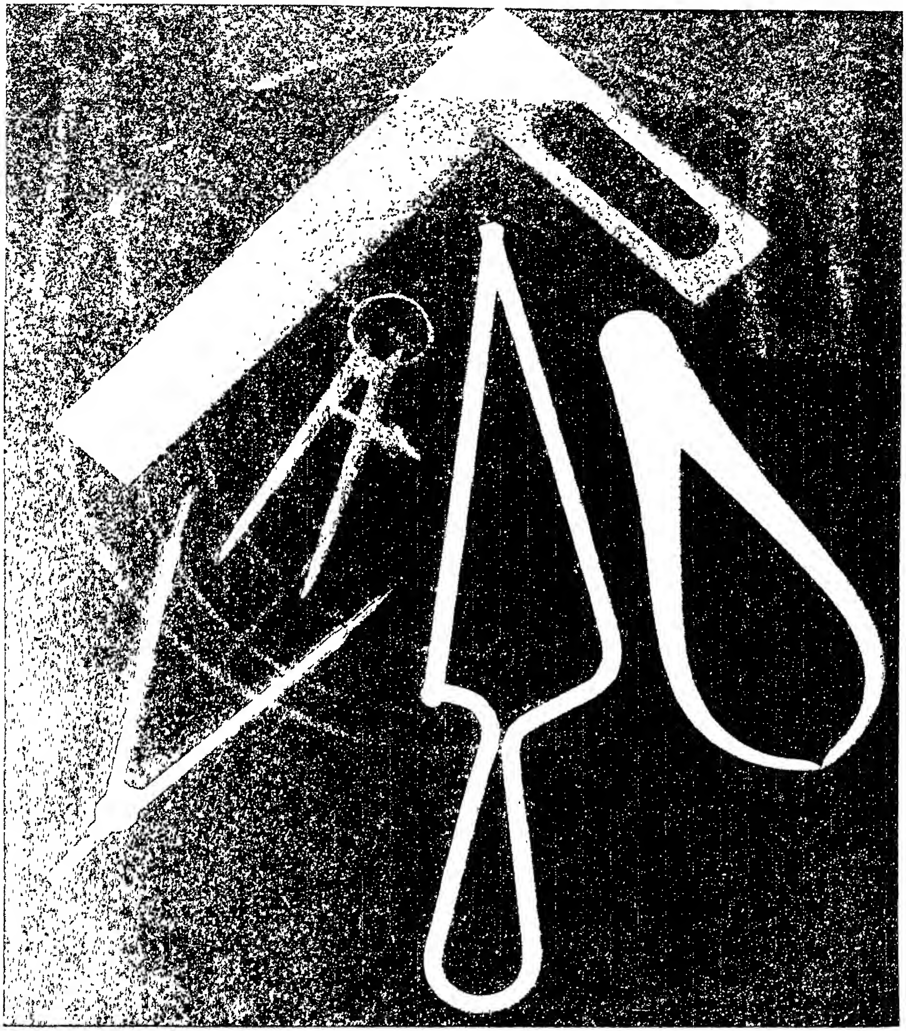
In America the favorite architectural motif out of this mélange we still have with us. It was a panel gently fluted, set into an otherwise blank (and functional) wall. We see it today, endlessly, in radio cabinet, refrigerator front, and shop façade, applied by the frank "stylists." Interior decoration ran to zigzags; mirror glass, textiles, etched glass, and even structural pillars

ran to asymmetical patterning. A world-famous dressmaker actually came from Paris to "style" an automobile, while competitive cars had extremely elegant Louis XIV body designs or perhaps represented, as advertisements in the leading periodicals of the time show, color schemes faithfully reproduced from Renaissance paintings. Bathrooms were no less distinguished.

Even homely commodities of domestic usefulness that had looked the same for a century, pots and pans, alarm clocks and garbage pails, had their own brief season of modernistic styling. A few manufacturers produced kitchen wares exclusively in intense colors such as fire-department red and Paris green, and teapot lids were to be seen on one side.

The sobering influences of 1929 tempered this wave of fashion extravagance. Its subsidence revealed a number of today's designers already at work, with results on the whole valuable and productive to industry. The new profession had emerged, but into a world sadly confused as to the need for and the work of the artist among the machines.

But to return to that unusual event of 1927 where "fine arts" critics and connoisseurs and an art-conscious public thrilled with something akin to wonder and aesthetic pleasure before the spectacle of reciprocating valves and steel crankshafts exhibited in an art gallery: we see the occasion now in historic perspective, as significant in the story of industrial design. There had been a showing of "Ready-Mades" in New York at an earlier date, in which Marcel Duchamp used such homely objects as factory-designed coal shovels and lawn mowers to dramatize the possibilities of American machines as a new world of adventure for the abstract artist. Later, in 1934, the Museum of Modern Art, in New York, was to assemble a notable exposition of machine parts and products, designed, as were the "Ready-Mades," without benefit of artist service. There is a familiar beauty to us now in all those objects, and in acoustical, chemical, and surgical instruments, in precision tools and certain electrical equipment. It is a commonplace that such beauty results



Woodworkers' tools of the sort exhibited with machines and machine parts at art galleries a decade ago, indicating a machine-age aesthetic. *(Photograph by Burt Martinson, from U. S. Camera 1936.)*

fortuitously from functional design where processes are elementary and parts uncomplicated. But here was a first public and critical recognition that machine and industry, fabled to have strewn the earth with ugliness, might have in themselves the potentialities of a new, hitherto undreamed-of art.

The most significant point to be made, however, is that it was not the industrialist, it was not the engineering designer, it was not the art critics and connoisseurs, who actually arrived at an aesthetic principle of functional rightness. It was the artist called to the factory. Only as he let his consciousness play over the possibilities presented in smooth forms, in sheer and gleaming metal surfaces, in glyptic massings, sharp edges; only as his vision became sensitized to secondary ranges of aesthetic values, to hard form and clean shadow, to unit and mass established by the mobile repeat pattern of objects emergent endlessly from machine centers; only, in short, as he exposed his soul to the factual realities of the contemporary machine world, did industrial design as an art expression begin. All that the experimenters from Picasso to Archipenko had been groping for in abstract experiments with the materials and properties of the industrial world became explicit then as techniques to be applied concretely in a new practice of art in daily life.

The principles are broad and general. The resulting style marks are few and simple. Honesty, simplicity, and functional expressiveness are the primary values involved and are basic alike to the streamline train, the cigarette lighter, the saucepan, or the grand piano as these emerge from the industrial designer's studio.

1. Materials are used honestly, each in accordance with its own intrinsic properties, its adaptation to machine processes, and its appearance values. Sheet metal is not artificially grained to imitate wood, and wood is not machine-turned in simulation of hand-carved forms or finished with laid-on surface patterning of any kind.

2. Simplicity is observed in the number and kinds of materials employed, and in the form given to the object, in keeping with the requirements of mass production.

3. Functional expressiveness is the artist's foundation. It is insistence upon engineering integrity as the starting point. The bed is not to be disguised as a bookcase; the telephone is not to be hidden in the petticoat of a perfumed Paris doll or in a handicraft cabinet. The anatomy of the bed or telephone—or clock, or camera, or cook spoon, or motor truck, or grand piano—is accepted as the basic design fact, and the artist's undertaking is to bring out of this fact a characteristic and expressive appearance, an appearance that is as beautiful in its own machine-age way as are the dynamo and the ball bearing in their way or the clean, bright, efficient surgical instrument.

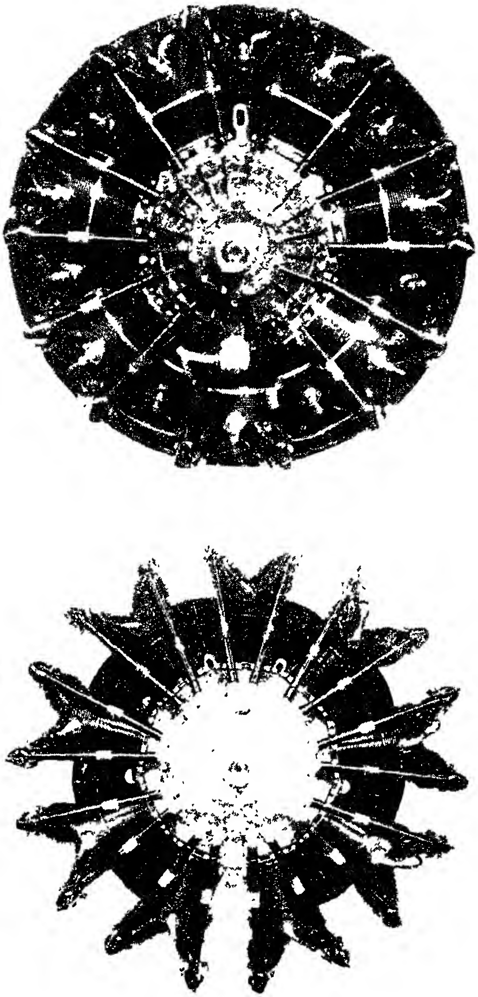
Because the approach is fundamental, and because the designer is artist-technologist, more than visual values emerge as a result of industrial-design procedure. The efficiency of the commodity is often increased, greater economy in its production is realized, and not infrequently a revolutionary new product appears to replace the old. This is now so well understood that representative industrial designers find demand for a large part of their services in the field of preliminary study: study in the field of rational engineering and in what is known as "consumer engineering." The specific contract to design is based upon such study and recommendations which follow it.

And we come to know the style marks as compounded of the engineering functional rightness of the product and the artist's confirmation of that rightness; of tangible, and intangible elements; elements that are rational and aesthetic. "Efficiency, economy, and right appearance"—these the typical industrial-design practitioner will state as his objectives in any design undertaking, regardless of the nature of the product. Wherever he sufficiently realizes them, wherever he achieves that unanalyzable plus

quality of art in merchandise, we recognize with a thrill the same characteristic machine-age style being produced by a new generation of architects, interior designers, mass-housing designers, and planners of model communities, by a range of new creative-technological workers busy throughout the fields which are determining the larger contemporary visual environment.

The machine, which has become the dominant fact of life, we begin to see also as the bringer of a complex of arts significant to the age. Today, for the first time since the Middle Ages, we are at a new major beginning, with new dimensions, new proportions, new possibilities, new freedom everywhere asserting themselves. We have the superb fact of twentieth-century engineering, and a generation of artists competent to take the dominant fact of their own age as the basis of a new expression throughout the useful arts. The airplane, the skyscraper, the new domestic architecture, organic community design: these are the most conspicuous marks of machine-age achievement on the average man's horizons. The artist designer has won from them today's outstanding aesthetic realities in the streamline, the sheer wall, the new horizontality in houses, the unit and multiple, each announcing in its own way an advance beyond the limitations of what was formerly accepted as "natural law."

The airplane, with its symbol the streamline, is the most conspicuous object of the new age. But automobiles in steady flow along a pleasure parkway, projectile-formed busses, trolleys, trains, even ambulances, become examples of a new mobile architecture, units in a rhythmic repeat pattern. They, too, are streamlined. The same freedom in space which is symbolized by the streamline in fast-traveling machines is written into the steel-construction skyscraper, where floor hangs airily above floor a thousand feet above the earth, or higher, with only slim steel uprights evident as support between floor and floor. The principle of verticality which makes tall towers seem to soar, and which announces in rising lines and sheer upright

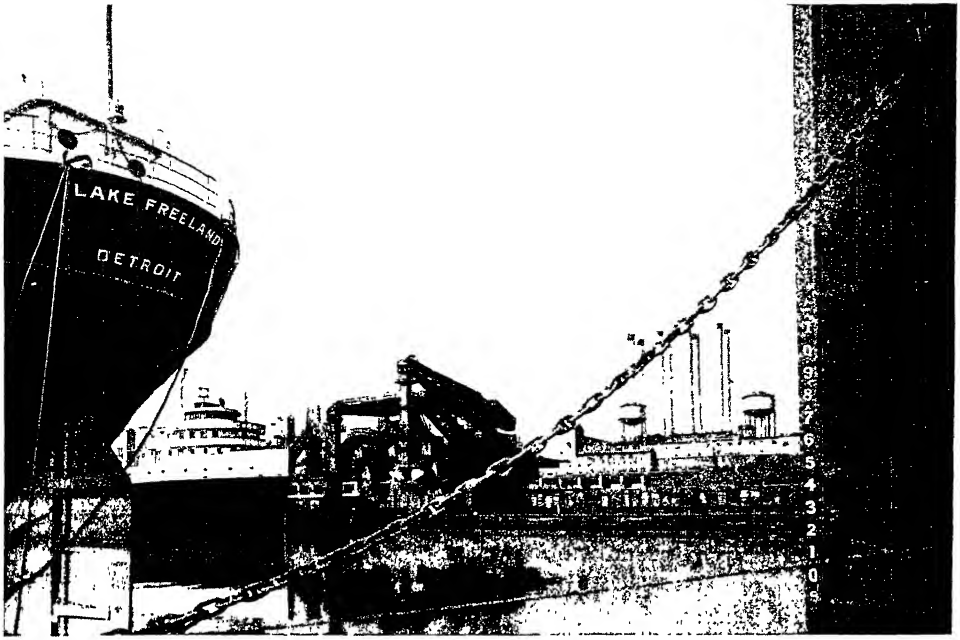


Two Pratt and Whitney airplane engines: abstract compositions arrived at without benefit of artist. *(By courtesy of Aeronautical Chamber of Commerce.)*

surfaces a power within the technologist's grasp to extend his structure to the heavens, appears in distinctive domestic building as the new horizontality. The skyscraper may, we already suspect, endure merely as a monument of a transition time and of its confused economic and social values. But we are learning to build into today's homes the same knowledge of machine-age materials and methods. We have long lines and sheer walls, broad areas of glass and slim bands of metal, extending and multiplying the resources of light and air and sunshine. But planning is organic and human as well as scientifically efficient. The house is no longer huddled close to its neighbors, but with the free spaces around it is an orderly unit in a larger design organism, the community.

Streamlined machines for rapid travel, skyscrapers, homes, neighborhood and community units have, then, a common aesthetic which they now share with the smallest furnishing, object, or appliance of daily use, because the same design principles have produced them. In the large they are all examples of industrial design. They represent the artist's ingenuity and vision added to what the machine can produce efficiently and economically. Altogether, they form the new synthesis of use and beauty to which all humanly useful things may be made to contribute, as rapidly as industrial-design ideals come to be understood and industrial-design standards are demanded in individual products.

What is spurious passes automatically. The eye, sensitized to the new values, comes to demand the subtle repetition of forms and proportions, the design character and style brought over from the larger realm into the more intimate environment. The objects on the dressing table, the typewriter, the clock, the cigarette lighter, the humidifier, and the thermostat begin to appear appropriate examples of industrial design when they have the same machine-age expressiveness blent of the utilitarian and the aesthetic. Individually judged, they must fulfill the expectation that they will bring



Engineering went this far in expressing machine marvels, before the artist came with his simplifying and design services. Ford Plant at Detroit, Michigan.

into the smaller circle of everyday living, each in its own way and to its own degree, an added element of machine-age freedom by widening control over the minutiae of the daily routine. When the industrial designer's willed intention sufficiently succeeds in bringing out of whatever object he works upon the peculiar beauty which first thrilled the public in machines and machine products of an elemental order, the inspiring streamline beauty of the airplane, the sheer, soaring, mass-and-line simplification that is a silo or a skyscraper (which is beauty because first it is usefulness in an intense age-of-the-machine sense), we know beyond a doubt that in it we have an example of the new useful art emergent; and that it shares a machine-age aesthetic with Modernist design products now becoming increasingly apparent on all our horizons.

The soundness of the industrial designer's contribution, the permanency of his place, are to be judged realistically by records of representative work of the past six years. There is ample evidence from industry that the profession has arrived at a place of security and even prestige. This has been realized during a time when all old-established professions were seriously affected by the world depression, when American industry itself was at its most crucial stage, and when the never very stable vocations of the "dressers" and "decorators" were (like that of architecture) at a crisis. A survey of today's design studios, laboratories, and offices affords convincing argument that a need of the times is being met, and reenforcement for the conviction that a vital social and cultural contribution is being made in terms which only the artist uses. The scope of industrial-design products already covers the whole field of industrially produced commodities.

The whole is a new expression, still in its formative stages. That the industrial designers who are working with creative integrity will go on to a more complete and organic form realization, and that out of the present primitive design expression will come a type of ornament truly significant

of the new way of life, new principles and new practices, follows. All past history is precedent for the expectation of such a cycle. But art is long and the machine is new. We can meantime best serve the future by loyalty to the appearance values that grow out of engineering.

Pennsylvania Railroad locomotive illustrating how the railroads have had recourse to artist redesign to dramatize the spirit of speed and power. By Raymond Loewy. ***(Photograph by Ivan Dmitri.)***

2. BACKGROUNDS IN ART AND IN INDUSTRY

NO new art comes into being without its own legitimate ancestry. This may be outside the traditional art stream. Historically, in fact, significant new movements appear as revolt against traditional theories and practices persisting after the life blood has drained out of the forms they produce. If American industrial design is such a significant new manifestation; if it has arisen as we assume where technological evolution within American mass production united with abstract art; if it is aesthetic expression grounded on functional mechanized form, then its antecedents are to be sought along two lines of influence:

1. The machine itself, regarded as a marvelous phenomenon, a new tool epochally brought to man's service, understood first as an instrument of material power, and then increasingly as symbol of a new universally applicable way of life.

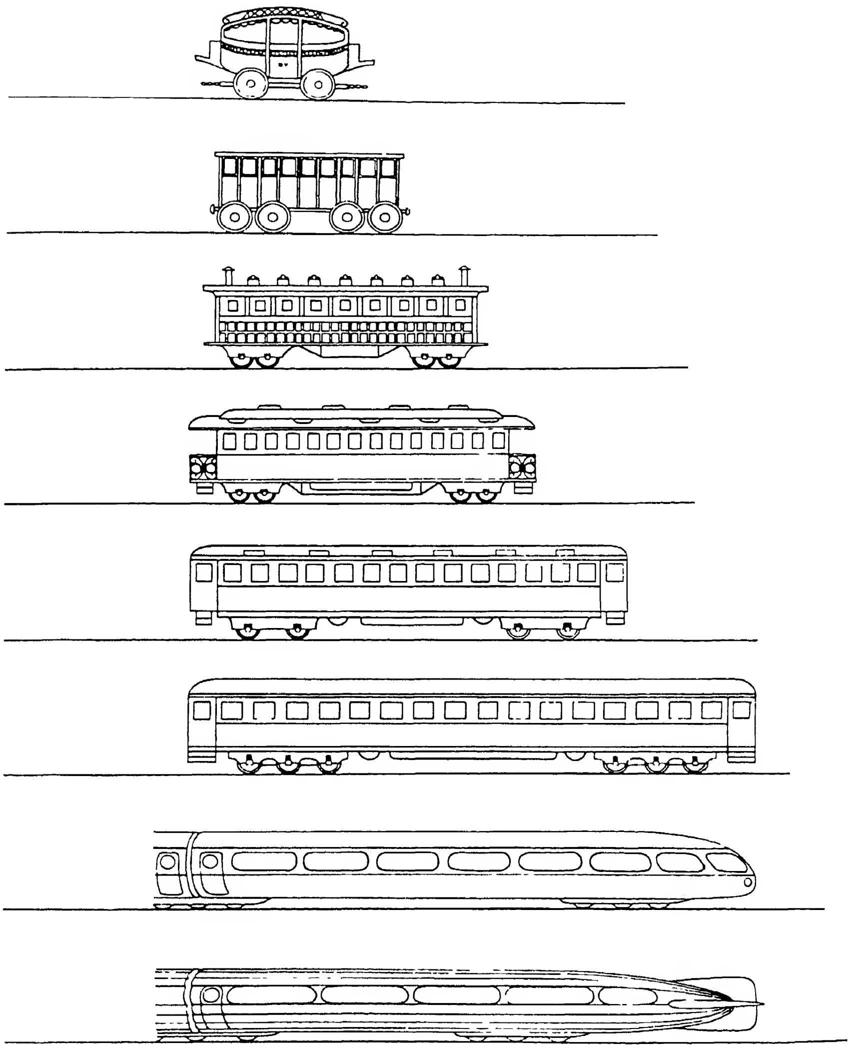
2. A new art spirit and a contemporary aesthetic, made manifest in so-called Modernist art in the half-century from 1880 to 1930—a spirit and an aesthetic which were themselves a revolt against current realistic painting and sculpture and the accompanying crafts movements.

In the process of even a brief survey of the two main influences, the first misconceived art as "applied to" the machine and machine products is revealed as a mere dead-end product, a phase of nineteenth-century deteriorated eclecticism, making no significant contribution to the development of art or the machine, though evidences of it persist in practice and in products throughout everyday life. Students of industrial design can dismiss the alien ornaments applied to conceal the nature of stoves and radios.

We now generally accept the machine's coming as a major evolutionary advance. The wonder of the machine need no longer be stressed. The thrill felt in its harnessed power, the admiration for its marvelously precise functioning, its adaptability, its capacity for multiplying commodities, are part of a common experience. We even begin to be surprised that poets and artists could not earlier see in the machine materials for epic literature and for an art fresh, strong, and vital, forgetting that the processes of cultural evolution are slow, that the history of industrial mechanization has been brief.

American machine industry is barely a hundred and forty years old. The practical utilization of the first wool-carding machine and the Whitney cotton gin, in 1794 and 1795, found the country "at zero," according to Chauncey M. Depew, industrialist and historian of "the first hundred years." At the opening of the nineteenth century, the building of machines had begun, and a start had been made toward industrial organization and financing. The close of the century saw completion of what we shall venture to call America's first industrial revolution. The whole period was, in perspective, one of unification of industry and science. Chronological accounts of American inventions for the century record a steady refinement of machine processes and multiplication of machine functions, a stepping up of machine speeds, and a spread of factory centers.

The water turbine, the high-pressure steam boiler, the fabrication of steel, perfection of the motor and the dynamo: these were factors. Morse, Bessemer, Roebling, Edison were figures. Inventions, discoveries, experiments, with always greater consolidation of capital, greater efforts toward industrial expansion, with more inventions, more discoveries, more experiments following each advance, ultimately inspired that first colossal dream of the machine in which it became instrument of unparalleled material power, a national dream of an empire of steel and concrete. Men—machines—money: these were the components. There were thoughts of art but they



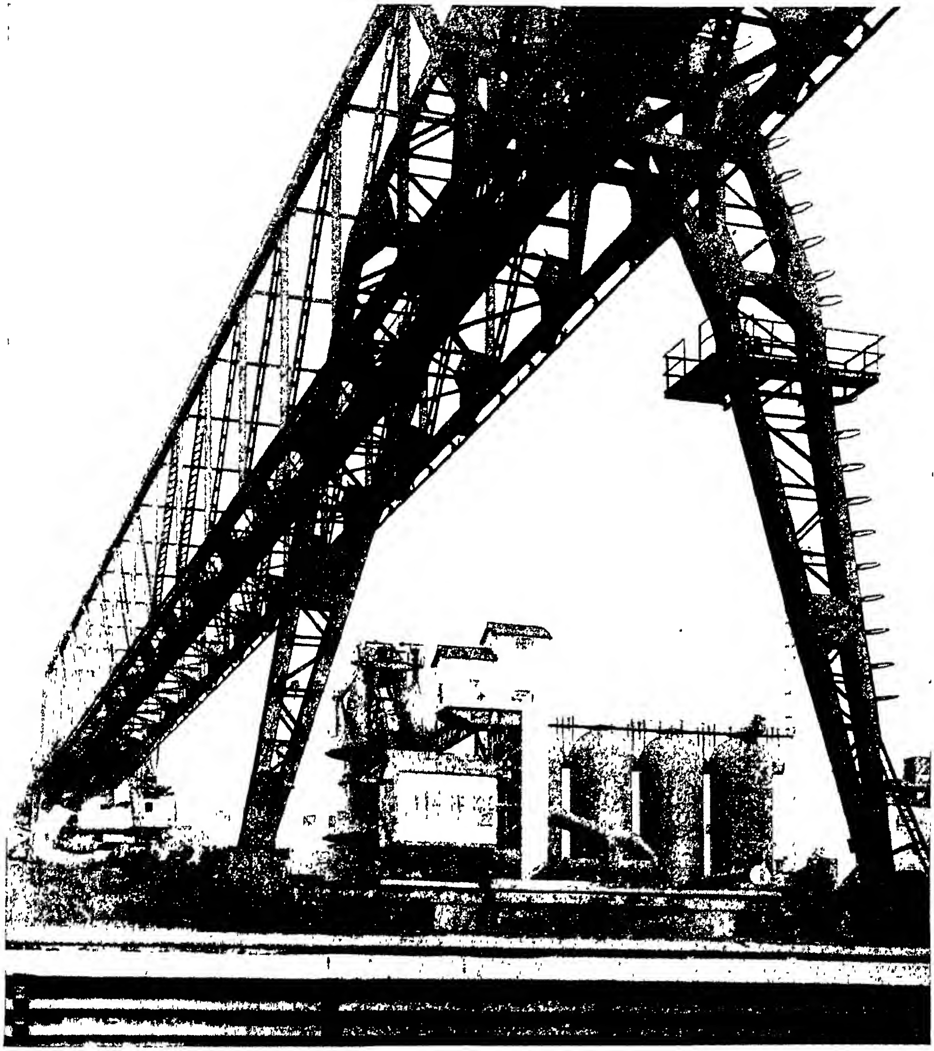
Evolution chart of railroad coaches, by Raymond Loewy, showing ancestry and recent tendency toward simplification and sheerness. Suggestive of the origins of streamlining and the new horizontality.

were of a New World culture to be realized out of Old World traditions and paid for out of what the machine produced. That out of the machine itself a new world culture might come was still undreamed.

The twentieth century was to bring America's second industrial revolution, more momentous than the first and accompanied by consequences not yet fully to be grasped. It came as mass production, if we are to define mass production as arrival of everyday life at a stage where it is commonly implemented and sustained by the machine. Machine is both means and end, the giver of work and the bringer of recreation after work. The American populations, rural to the end of the nineteenth century, became predominantly urban. The era of technological advance, of machine utilitarianism, merged into what we now see as the beginning of the age of machine-implemented culture. The way had been prepared for the present acceptance of the machine as a precision instrument sufficiently delicate and responsive to take an artist product and multiply it, by millions when desirable, without obscuring the artist touch and without losing even in the millionth reproduction the artist's design integrity.

The Ford automobile affords a convenient epitome of the twentieth century in industry. It may be taken as symbol of the change in the machine's basic motivation from mass to quality. Within its story is the story of industrial design's inception. Henry Ford's now famous early aphorism that he would not give a nickel for all the art in the world was coined out of the currency of industry's realistic era, when art everywhere failed to interpret life significantly, and when buyers of the little, cheap, early automobile had still not arrived at an appreciation of the machine as beauty. His later aphorism concerning art was to come out of the new era.

The Ford automobile of 1908, meantime, gave the world its first demonstration of a fine mechanism (not so different, after all, in complexity, ingenuity, and precision, from the product of the Swiss watchmaker) mass-



The machine and engineering as sources of art forms. Purely functional architecture as devised by engineers at the Ford Plant, River Rouge, Detroit, Michigan.

produced by the methods which had already multiplied cheap clothes and furniture. The Ford plant perfected a system. By that system, Henry Ford became the richest man in the world, and his plant became the largest factory. More pertinent, this was the same system which, through a process of orderly evolution, created a necessity for the complete redesign of the product to bring it up to an appearance standard. That was in 1927.

Mass fabrication of materials, mass production of parts, mechanical assembly, division of labor by specialization: these were the components of the system. But it was a system that could be employed elsewhere. Competitors came into the field, paid increasing attention to smartness of appearance, and even while charging more for their products began claiming the market established by the mechanical efficiency, durability, and cheapness of the automobile made by the Ford factories.

In 1927, at the end of the Ford plant's nineteenth year, the fifteen millionth "tin Lizzie" was completed, and the Ford plant was closed down. It reopened shortly afterward, enlarged, retooled, at a total cost reported to have run into billions. Since then, the long succession of new designs from the 1928 Model A to the 1936 have held their own in the market and on the highways, in the endless streams of long, low-hung, quiet-running, bright-colored motors. Thus Henry Ford arrived at the end of the old era and the beginning of a new, and reversed his judgment as expressed in the earlier aphorism, substituting for it this saying: "Design will take more advantage of the power of the machine to go beyond what the hand can do, and will give us a whole new art."

Ford has shown that all mass production is crude in its early stages, and that a standard of quality is introduced gradually as the processes are perfected. Technological evolution not only opens the way thus to appearance design but permits ultimately a considerable range of models. Today's automobile buyer is given a wide choice of color and style combinations in

New sources of repeat patterns in machine equipment and in mass products. Two photographs by Margaret Bourke-White of dynamos and loud-speakers. *(By courtesy of National Broadcasting Company.)*

all the lowest cost cars, because the prefabrication of interchangeable features has been perfected, where earlier the attempt to produce more than one combination would have upset the system.

To complete the story out of the experience of the one plant, it may be added that Ford went on to industrial design in the modern sense in the construction of his many factories, and even dramatized, at world expositions, the spirit of mechanized industry which is at the heart of the new art. The one example summarizes the history of twentieth-century manufacture and accounts for the machine consciousness which is one root of the new industrial design. One cycle was at an end, another initiated.

When the point was reached at which industry needed art, and artists were being found who could interpret machined industry in its own spirit, a few people remembered that an American prophet of the eighties had asked for a new art out of engineering and out of the new building methods and materials. Louis Sullivan was far more than author of an overquoted axiom about form and function. He and Cézanne were brother prophets crying out simultaneously in the wilderness of sterile, imitative, nineteenth-century architecture and painting. Cézanne heralded the new way of *seeing.* Sullivan saw the new way of *doing.*

Louis Sullivan demanded honest expression of function and of materials. He asked for *organic* building and foreshadowed today's ideal: that there is to be constructed out of industrial forms such an expression of industrial America's life as will become the American machine-age architecture. His follower, Frank Lloyd Wright, was to save the ideal from obscurity and daringly carry it on in his own architectural works, and in his insurgent gospel that has been a formative force in the field we call industrial design. In 1905, Wright pointed out that the conception of the machine as spreader of the blight of ugliness prevailed because creative artists failed to accept the machine as an instrument for producing its own legitimate and vital art. He

spoke of the machine as man's peerless creative tool, and challenged the artist to new beginnings with machine understanding, machine loyalty.

Sullivan and Wright were architects. America's rediscovery of them in the 1920's came with acceptance of the machine, at last, as source and instrument of the characteristic and virile art of the age. It was particularly significant because it was now seen that the second industrial revolution was destined to transform not only the manufactured product but the building art as well. Sullivan had embodied in his philosophy an aesthetic of all things that man contrives in mass for man's uses, with only a difference of degree between airplane and ash tray, streamline train and toy cart, and vanity case and skyscraper.

More remote from the machine is that other figure that influences the designer of today's industrial products. Cézanne, a half-century ago, initiated the train of study, experiment, and practice which eventuated in the abstract art of Cubists, Constructivists, and Purists. From them our own leading designers learned directly, both the native products of American life and schools, Geddes, Deskey, Sakier, and the European-trained "radicals," Lescaze and Kiesler. Any well-informed art student will be able to point out certain common principles of form relationship and expressiveness of materials, in Sakier's plumbing fixtures and Brancusi's sculptures, in Geddes' block-unit gas stove and Mondrian's or Hélion's abstract paintings. At least one widely publicized exhibition has been planned to emphasize the commonly shared principles in abstract art and in work of the industrial-design profession. It was the "Dynamic Design" exhibition held in 1934 by the Philadelphia Art Alliance.

Cézanne's *new way of seeing* was to penetrate through to some underlying structural form of all created things. His search involved a resolute laying aside of traditional ideas of art. In his water colors he arrived at an almost abstract statement of what he saw or divined. In his oil paintings he

slurred over natural elements and forms to fix an approximation of absolute form. Above all, he gave a starting point to the Cubists, who glimpsed in his pictures a sort of mathematical statement of structure and order.

It was Picasso, however, whom we shall permanently acknowledge as the first user of machine forms and mechanical laws in living art creations. Like Cézanne, he denied visible nature as the only or chief source of pictorial materials, and pushed behind aspects to find a more fundamental order for design. These two brought painting (and sculpture) to a concern with elemental form relationships. Picasso absorbed a new set of impulses and impressions out of the machine-age environment, and utilized them according to principles now recognized as underlying Modernist painting. His abstract study, "The Guitarist," might serve as an architect's drawing for assembling the elements of building construction. Commenting on this, Frederick Kiesler, in *Contemporary Art Applied to the Store and Its Display,* says: " 'The Guitarist' is almost a skeleton of horizontals and verticals, rather like a modern building of glass, steel, and brick --the strokes of the brush are carefully laid beside each other like stones, and help the building up of the picture . . . brush strokes are especially massed and thickened as they approach a vertical or an angle as if to support it by their weight, and to emphasize unmistakably the firmness of the composition." He poses on the same page with the Picasso picture one of his own studies for window-display fixtures which were made and used, noting that both rely strongly upon the same characteristic use of horizontals and verticals.

Picasso ventured further, actually building three-dimensional forms that stand free as a building construction would, and exploring the aesthetic possibilities of sculptures where the conventional surface and texture effects (as in skin and in silk) were supplanted by the natural grain or polish of the new industrial material employed. He foreshadowed much that was done by the generation of artist-scientists that followed: in using elemental mate-

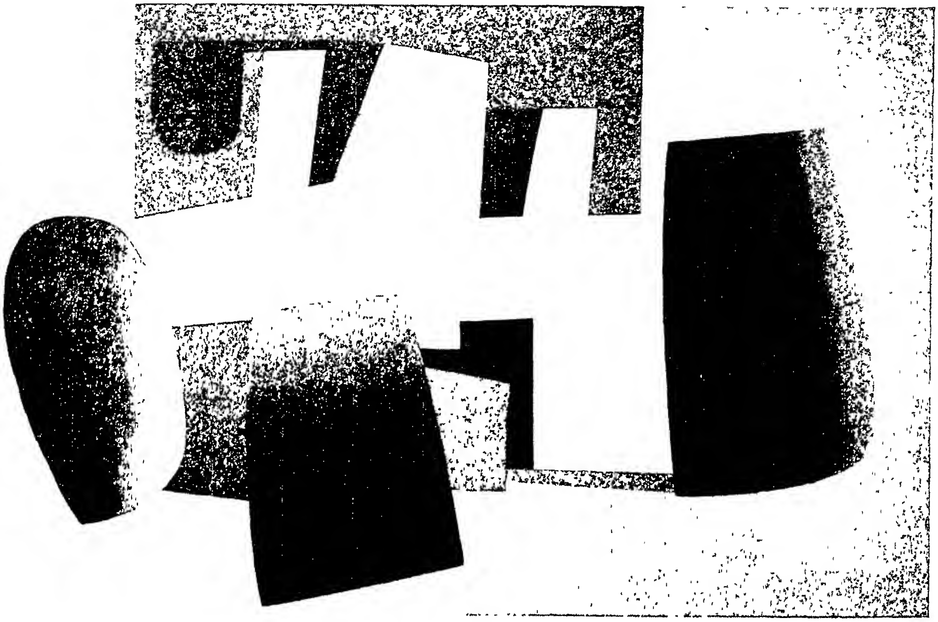
Modern abstract sculpture as a suggestive parallel to machine-age industrial design. *Boxing*, a figure by Alexander Archipenko.

rials, in exploring the tactile possibilities of those materials and making them aesthetically expressive, and in using simple colors directly and in few values.

The effort was, in essence, the clearing away of traditional symbols that had grown sterile and meaningless, and making fresh beginnings. A new set of visual truths valid to express the new age of the machine was being realized. It had to make its way slowly against all that had been done since the beginning of the Renaissance to reduce art to a science of surface appearance; against the old conventions of perspective, truth to anatomy, the eye's account of coloring.

Alexander Archipenko, Paris-educated, Americanized Russian artist, world figure in the small group of significant abstract sculptors, is one of the most exciting connecting links between early abstractionist experimenters and today's industrial designers. He went even further than Picasso in testing materials for basic sculptural values. He carried experiments in pure plastic composition to where, some sensitive beholders witness, they seem to live and leap till the human figure becomes an abstraction of the upward aspiring life principle, objectifying in sculptural form the mystical component in a characteristic El Greco painting. Then he turned to practical work.

Archipenko made wooden female sculptures and draped them with the latest style clothes, in one of the most arresting of those early three-dimensional window displays of the Fifth Avenue department stores. Thus, with a group of artists, he pioneered in giving the American public its first shock of consciousness that there was a new sort of creative worker busy behind the scenes, not only in art galleries but in stores. The mechanics of modern stage setting and lights and color design were employed for achieving a dramatic unification in a window. The artist set the scene as he would a play, often using a single merchandise item or fashion motif as focal point of interest. Nor was the abstract element greatly modified in these early practical applications. Several of today's industrial designers were among the artists



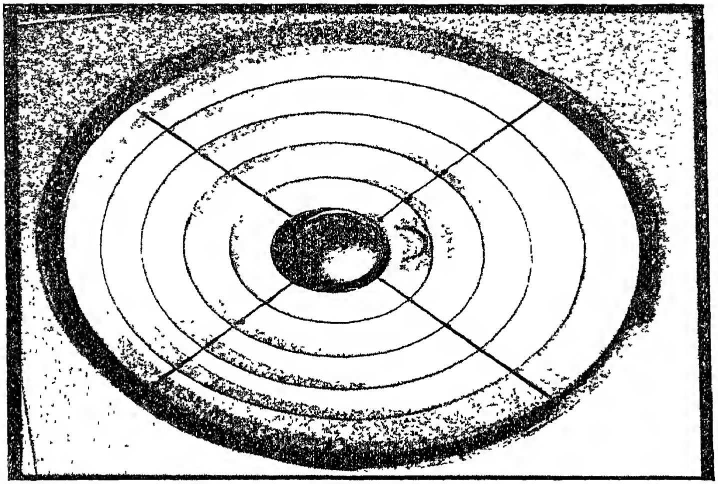
Painting by Jean Hélion suggesting the parallel aesthetic values of modern abstract art and typical industrial art.

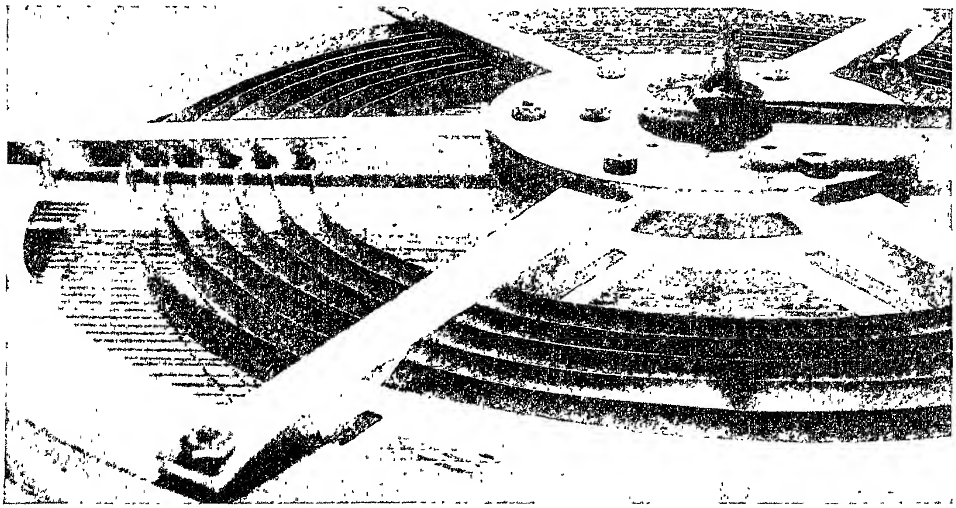
experimenting with window staging: Donald Deskey, Norman Bel Geddes, Frederick Kiesler, Raymond Loewy. Some of the Archipenko designs are still in use, as are three-dimensional display effects by the other men.

Meantime, the Constructivists in Europe had been exploring into the potentialities of basic materials in relation to such mechanical fundamentals as balance and dynamics. They experimented especially with the elements of the machine, with wheels and steel bars, and gears, and wires. They achieved constructions with so precise a sense of equilibrium and expressive rightness that the slightest shifting of a block or fulcrum destroyed the appearance of ordered form. Their discoveries in the fields of static equilibrium and kinetic forces carried the understanding of abstract art one step nearer to use in practical design.

One group was building nonutilitarian equivalents of horses—and even of human females—using industrial materials and substituting principles of mechanical construction for physiological formations. At the same time the Neoplasticists were seeking a fresh aesthetic realization out of more exact adjustments of volumes, areas, and tactile values. The Constructivists and the Neoplasticists we may today regard as experimenters approaching the problem from different angles, and prematurely cut short in their efforts everywhere by social or political upheavals. The end arrived at by the several groups was a new understanding of the relationship between pure sculptural form and industrial-design form.

In Germany, theory and experimental practice were brought together in one laboratory as has never been done in America (or any other country). At Weimar first, then Dessau, the Bauhaus group established school and shop for tests of materials, principles, and machine tools. The various theories of abstract art were brought to focus in one sustained experiment, and mass-production machinery was called upon to prove its ability to duplicate the form creations of the dually trained mechanic-artists. In that most notable





Abstract art values integral to industrial design. Above, a ceiling light by William Lescaze; below, radio mechanism, photographed by Margaret Bourke-White. *(By courtesy of National Broadcasting Company.)*

of machine-age educational experiments (unfortunately discontinued in 1931 under political pressure), three of the world's most gifted abstract painters, Kandinsky, Klee, and Feininger, sat in council with architects, with engineers, and with mechanics.

The juxtaposition is a symbol of the world development of which American industrial design as treated in this book is an instance. At the Bauhaus a new synthesis was made evident: abstract Modern art, the new industrial design, and the new world architecture were shown to be inseparable aspects of one machine-age aesthetic achievement. Whether the twentieth-century type development in painting and sculpture is called merely Post-impressionism, or, more reasonably, Expressionism, it is linked in deepest principle with the industrial and architectural design of Geddes and Lescaze, of Sakier and Neutra.

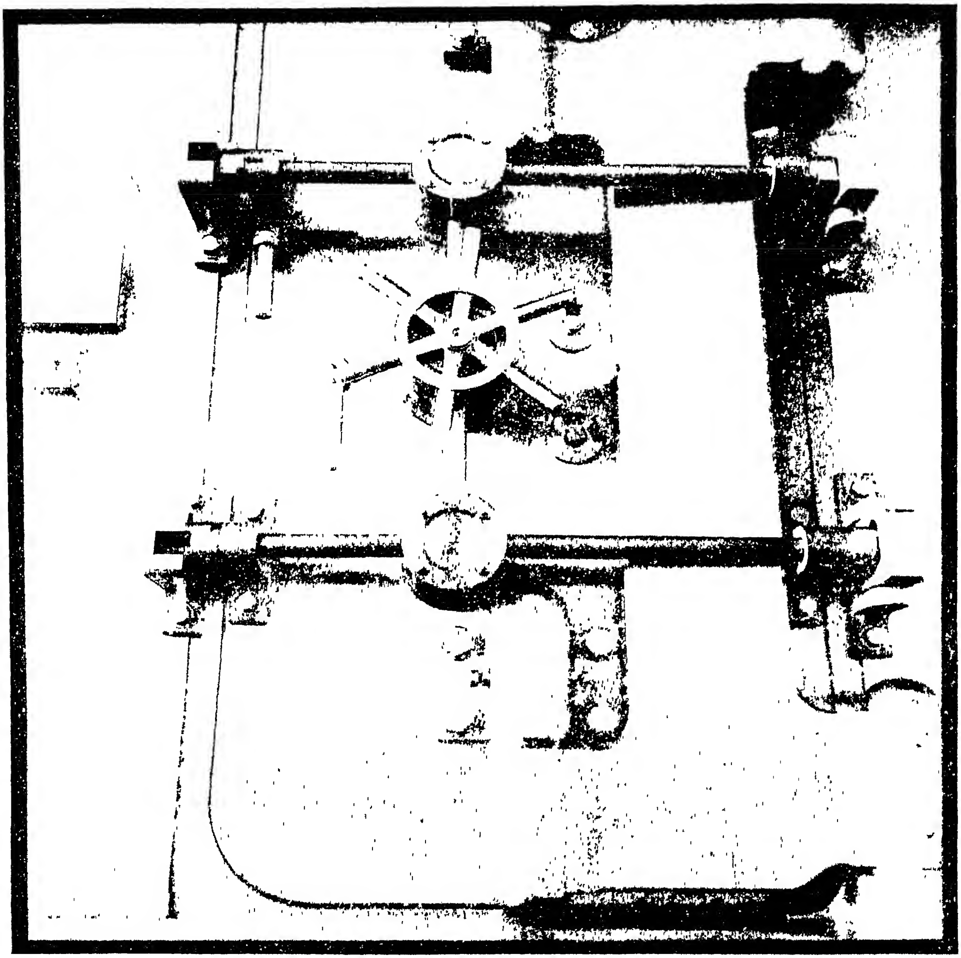
Occasionally—lending emphasis to the connection—an outstanding abstractionist painter actually steps over into the industrial field. In America, Charles Sheeler, a painter long known as a Purist, capable of creating almost unearthly beauty in the ordering of a few simple forms in space, has been turning his hand recently to experiments in coffeepot form and soupspoon form as well as to new sorts of designs for textiles.

Critics and observers hostile to abstract art would deny the identification of the Cézanne-Cubist-Constructivist development in the fine arts as one of the two main sources of modern industrial design. But even without the example of the Bauhaus, its eloquent assembly of experimental art schools and machine shops under one roof, there would be the testimony of the pioneer leaders among today's artists in industry. Deskey and Dreyfuss, Geddes and Sakier, Lescaze and Kiesler, all speak the language of the Modern art studio, and all, to some degree, have practiced in painting and sculpture. They bring the essence of Cézannism and Abstractionism to the practical job of designing for the machine. They acknowledge an indebted-

ness to Moholy-Nagy and van der Rohe and Lissitzsky, though not audibly in the presence of industrialists who are fearful of aesthetic theory and studio talk, and likely to be nervous in the presence of "pure" art.

Considering the somewhat perilous if not anomalous position of the painter today, there is an element almost ironic in the spectacle of the industrial designer taking the results of a half century of purist experiment and turning them to his own and industry's profit.

Two apparently irreconcilable and antithetical extremes of human ingenuity meet and are reconciled in this new figure: heavy, commercial, systematized technics and theoretical, abstract, pure art. When the definitive history is written, we believe, the chapters on background will deal with the two phenomena, the rise of the machine as a factor in civilization, and the revolution of aesthetic along the line marked out by Cézanne.



Machine parts artist-organized; door of vault, Philadelphia Savings Fund Society. Howe and Lescaze, architects.

3. HANDICRAFT AND MACHINE CRAFT

THE record of art in—or rather on—the machine and its products was until the 1920's almost exclusively one of inappropriate borrowing, with unfortunate visual results. It was for this reason that Lewis Mumford could write that "Ornament conceived apart from function was as barbarous as the tattooing of the human body." Some others have gone so far as to speak of "the infection of ornament"—apparently condemning not only the borrowed sort but any that might ultimately grow out of the machine's own processes and materials and "feel."

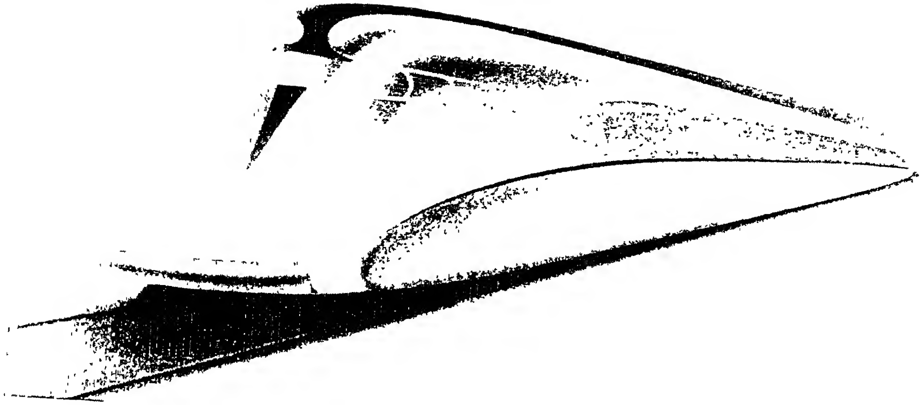
Only the crude pioneering stages of industry's organization, on the one hand, and on the other the movements of breakup and reform that ran through all the arts, can account for the wrong direction from the outset: for the misunderstanding of machine function and the superficial adornment of machine parts and forms, or for the prostitution of handicraft effects to machine imitation and mechanical duplication.

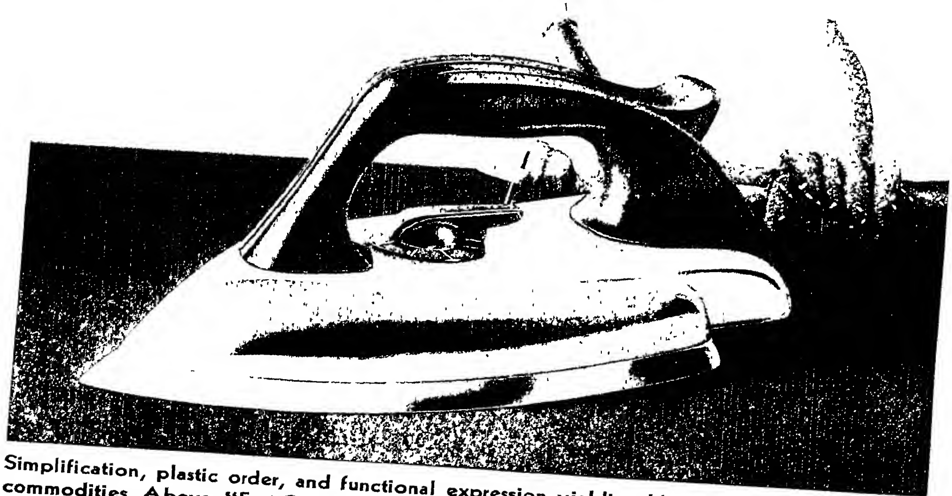
Today we see handicraft as having flourished immemorially, developing its own forms and ornamentation under laws determined largely by its materials and tools and the hand's typical manipulation of them. And it will continue to flourish (though decreasingly as a popular market commodity) by reason of honest adherence to those fundamentals. But we see also by contrast how machine production depends for its integrity and distinction upon the artist's acceptance of the machine as tool, and upon a greatly widened range of materials particularly adapted to mechanical manipulation and duplication. A certain honesty of approach and a devotion to functional expression are common to both handicraftsman and worker for the machine. The attempt to transfer ornamental idioms and toolmarks from the one field to the other is what led to a century of mistaken effort. It is fundamental that

each type of art work must be true to its materials and its processes; and that the ornament and style marks which appear as the type is matured and refined cannot legitimately be imitated elsewhere, under other conditioning processes and circumstances.

The impulse came early for touches of refinement for the machine's awkward constructions and shoddy products. France took the lead in providing them, as may be verified from the pages of periodicals and books of the early nineteenth century. The French industrialists, in developing machine methods, imitated their own superior hand-determined models. France had held the lead in production of unique craftsmanship and luxury merchandise for a century, since the time of Louis XIV, and this was merely a means of extending her authority and trade.

But the spirit of the old workshops where the Gobelin tapestries, the Aubusson carpets, and the fine china and glass and objects of marble and gold and silver were created, for the Palace of Versailles and for world markets, could not survive the coming of machine industry and its wholesale methods. Napoleon, to be sure, found exhibitions of contemporary work from such artcraft centers which, in the first flush of his victories, he hailed, *"la plus belle de ses victoires."* But already mechanization of industries was transferring emphasis everywhere from original handicraft work to machine-imitated and machine-reproduced work, with always less art and more misused machine. And presently France was center of interest for all industrialized countries by reason of her new methods and products. Manufacturer, scientist, financier, and the working class formed the complex, with state trade schools and museums for the benefit of workers who were to provide industry's refinement, but with no thought of the artist as factor. French exhibitions provided precedent and led finally to the first great world's fair of industrial design and industrial art at the Crystal Palace in London in 1851.





Simplification, plastic order, and functional expression yielding like results in two redesigned commodities. Above, "Fast Commuter" railway car, by Raymond Loewy; below, Westinghouse electric iron by anonymous designer.

Today's Modernist knows the Crystal Palace, Sir John Paxton's "temporary contrivance" in iron and glass, as belonging with the great nineteenth-century monuments of engineering; and as creative forerunner, with the Eiffel Tower and Brooklyn Bridge, of the age of steel construction. To the period that produced it, it was only the shelter for keenly competitive showings demonstrating the extent to which embellishment could be added to the machine's product. The prevalent attitude is embodied in the exposition's illustrated catalogue:

"Ornament is one of the mind's necessities gratified by means of the eye. So it has been discovered to be an essential element in commercial prosperity. This was not so at first because in a less cultivated state we are quite satisfied with the gratification of our merely physical wants, but in a more advanced state the more extensive wants of the mind demand still more pressingly to be satisfied. Hence ornament is now as material an interest in a commercial community as the raw materials of manufacture itself."

America had still produced no art of consequence. Her ornament for the machine was frankly borrowed from Europe and skilled workmen were imported from France to put it on—and from Germany, Switzerland, England, and Italy. She exhibited no notable industrial art at the Crystal Palace, but entered objects of mechanical ingenuity which won the applause of the spectators. One of them was a metallic chair. Its body was upholstered in rose brocade. It had a metal tripod richly floriated, supported on a metal stem like that of an ordinary music stool, but with the additional advantage of a spring arranged to give free motion in all directions while it revolved on an axis. "Both the elegance and the certainty" of this chair were matters of favorable comment.

When America built a Crystal Palace of her own, in Bryant Park, New York, and held an international exhibition of her own there in 1853, the occasion served to call the attention of other countries to the fact that there

had been little attempt to "strike out a national style." "The many peculiar features of the country, the habits of the people, and undoubted originality in mechanical arts would lead to the inference that a gradual repudiation of European modes and forms will ultimately take place in art as applied to the utilities of life." This is a quotation from the report of the official English commission to the exposition, which further recorded:

"At present the co-mingling of totally different styles of decoration in architecture, and the adoption of European designs for totally different purposes to those for which they were originally intended are among the least of the errors committed in a vague seeking after novelty."

America, chastened perhaps by her former ignominies, attempted no competitive display of industrial art at the great Universal Exposition in Paris in 1867, but was commended officially for the original and noteworthy quality apparent in machinery and mechanical design. The United States Official Commission, Frank Leslie, S. F. B. Morse, and Thomas W. Evans, found that the United States still sustained a colonial, not to say provincial relationship to Europe in the matter of grace and ornamentation in articles of construction and of common use, but that we "exhibited locomotives which, if somewhat meretricious in ornamentation, were nevertheless beautiful in comparison with the ungainly monsters exhibited by other countries. . . . In lightness and tasteful outline, no carriages were comparable with those of the United States . . . and the gas fixtures, chandeliers, and other lighting apparatus exhibited by the Tucker Manufacturing Company were certainly equal to those of any other country. No billiard tables were equal to those of the United States in elegance and excellence."

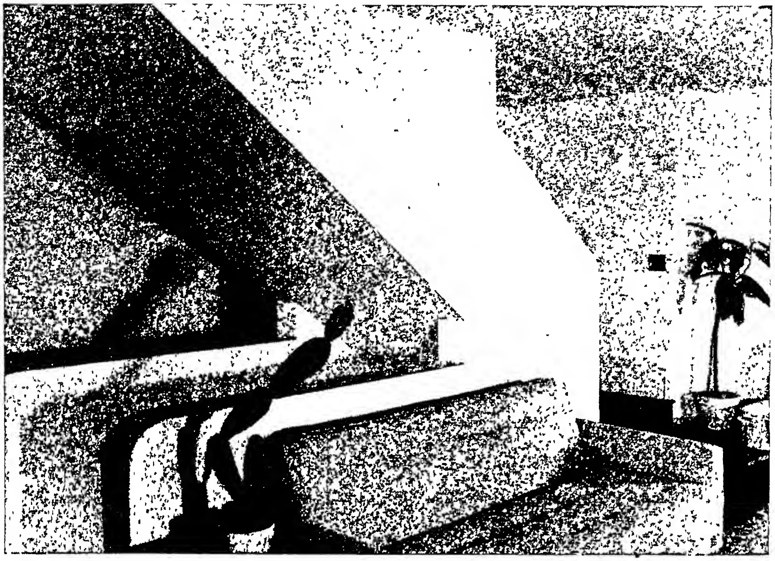
This report, which became an official United States public document, is in effect a challenge to American industry in behalf of "chaste and tasteful design, . . . not less in lampposts and hydrants than in household furniture and jewelry, not less for the hangings and calicoes of the poor than for the

soft carpetings and silks of the rich." The practical usefulness of European precedent was increased, in the report, by detail drawings, and there was a separate portfolio of elaborately executed colored engravings (now in the Library of Congress) representing carefully selected examples of "fine arts in useful arts" appropriate to be followed in America.

The elaborate cast-iron fountains and lampposts, the cast-iron hatracks and umbrella stands and mantelpieces even more elaborate, the crystal and gilt chandeliers and marble and bronze clocks: all these were influences, and helped to account for the character of design at the Philadelphia Centennial Exposition of 1876.

In both Europe and America, steadily, to the end of the century, the impulse to decorate continued. All recognized cultural periods of the past had long since been raided, and their treasures reduced to patterns, numbered ready to be laid on to the machine and its products. The basic forms of industrial objects had been obscured by decorations.

The reaction which came with a better understanding of machine function, and an advance in public taste, made itself felt only gradually. The generation that travels by airplane and listens to the radio repudiates the idea of painted bouquets and crossed flags as adornments on locomotives and sewing machines. It smiles at the nickeled festoons on old cooking stoves and printing presses and grocery scales and early electric meter boxes. We have put them away, with the iron dog and the hedge cut to peacock form from the lawn, and with the wax flowers under glass from the top of the knickknack cabinet. But we still have the more enduring imitation Moorish dome and minaret on the best seaside hotels. We have Egyptian obelisks and Florentine fortress palaces for water towers and country-house gate lodges. And because we still have some of the old conception of "the eye's necessity for ornament," we have gasoline stations that are Greek temples in miniature, crimson colored to increase their visibility for the motorist.



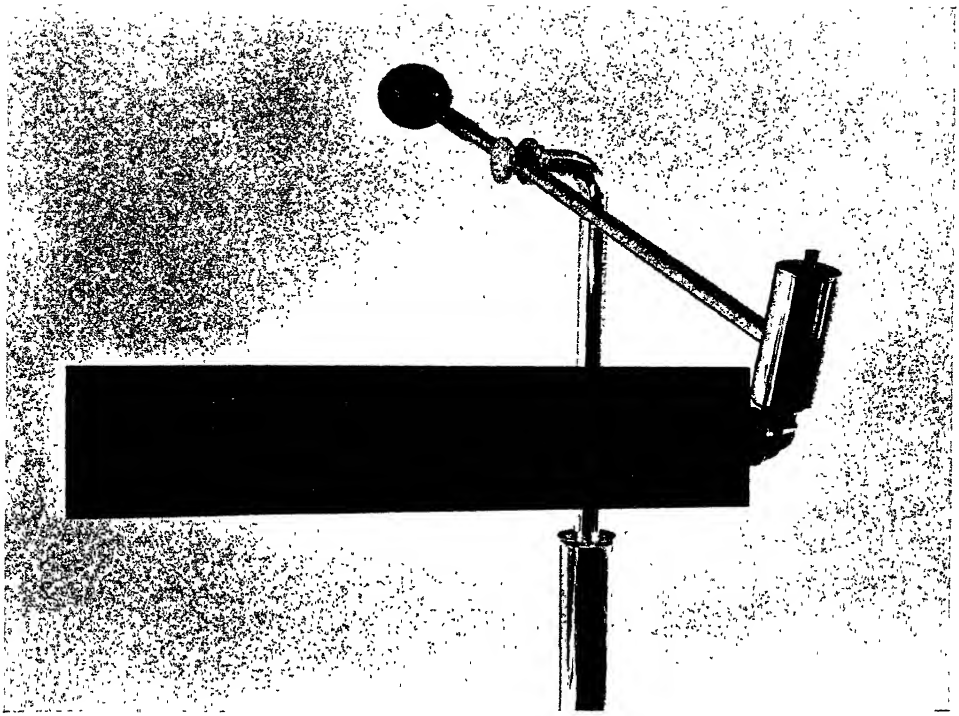
Idioms of the machine and of abstract art appearing in interior architecture, in an apartment designed by Eleanor LeMaire.

The machine was thus misused, masked, falsely frilled out with feminine and regal ornament, through its first century of contact with "art"; and machined industry was given a bad name wherever artists congregated—before anyone realized that the potentialities of a typical new art were hidden in the marvels of the engine itself. But the early confusion and the later vision need not be considered reason for discrediting handicraft, on its own ground, as a continuing creative activity.

Because the borrowing is now seen as wrong, a few extreme Functionalists believe that all nonmachined art is in violation of the principles of the new age. To them the prized mark of the craftsman's hand is well lost in an age that produced the gleaming functional beauty of a million Ford cars; the rarity value of a handmade cabinet or brooch does not count in a world where one artist's designs potentially transform the furniture and plumbing of countless families.

But we prefer the reasonable middle view: the greater proportion of articles and mechanisms commonly used has now been claimed for machine-duplicated production; and gradually all but a *very* small margin of commodities will be turned out mechanically from artist-designed patterns. But this leaves a group of objects for which adequate machine processing has not yet been devised, and despite the march of invention there will always be some problems better solved by hand artisanship. Thus the handicrafts of traditional sorts survive today, to a small degree even commercially. And it seems likely that there will always be individual demands to which the machine cannot economically cater, in such fields as furniture making, bookbinding, and architectural accessories.

Beyond this margin of handicraft to meet special demands, there is now the considerable luxury trade in handmade articles which are valued as unique creations. Although the comparable machine-duplicated vase or cake tray or motorcar may be intrinsically as beautiful as the specially



Adjustable electric lamp, by Frederick Kiesler, in which functional and structural elements are combined in a calculated abstract composition.

designed or custom-made example, the latter will be preferred by people able to pay for the element of uniqueness. A sort of connoisseurship has been built up and is likely to continue in spite of the obvious logic of a general shift to machine art properly designed.

In short, handicraft survives in the power-age world as continuing answer to problems not yet solvable by the machine and as purveyor to a more and more limited connoisseur trade. But it is as important to the craft-worker as it is to the industrial designer that the fundamental division come clear: handicraft is one thing, machine craft another. Each has its own aesthetic. The products of the one will have visual aspects and physical form different from the other, and no permanent progress is to be made on either side till this fact is realized.

If the William Morris ideals of escape from a machine-implemented world to a simpler, more medieval artist existence seem beside the issue in America today, we should not forget that Morris himself brought back to craftsmanship certain qualities long obscured but now recognized as akin to values in machine design. Most notably there were the functional simplicity of furniture design, the use of effects natural to such materials as wood and enamel, in place of the lavish applied ornament of his time, and also a tendency toward abstraction in ornament instead of the usual Victorian naturalism. The influence upon present-day design in certain European countries has been a direct one. The Viennese Secession group and the several associated schools and crafts shops (particularly the *Wiener-Werkstaette* under Joseph Hoffmann) at times carried the Morris principles of simplicity and integrity across to the machine-tool field, bridging after a fashion the chasm between exclusive hand-work and machine work. But it was Sweden which became, in the 1920's, world exemplar in this field.

In Sweden there is parallel production, at a high level, of handicraft articles and mass-duplicated ones—both under official patronage and both

celebrated wherever standards of design and methods of production are under scrutiny. Swedish glass and pottery and decorative textiles particularly have been prized in the international market. Designs for commodities less easily exported, furniture and metalware and woodcarving, have been endlessly illustrated, particularly in British publications, as models of "the middle way": to show, perhaps, how the old standards of beauty can be retained while machines *gradually* take over the manufacturing burden, and thus the sudden shock of transfer, such as that in America or Germany, avoided. The Swedish development, indeed, is rather uncritically lauded by half a dozen leading English writers and educators, who would make this a world example of reasonable progress—they believing that the softened forms and simplified ornamentation, nearer to "applied art" standards, are more acceptable, in short more beautiful, than the products of mid-European and American factories, with their aesthetic expression growing out of functionalism.

The Swedish contribution, appealing and honest as it is, and near-ideal for Sweden, is considerably less than a safe universal model. A small ancient country with a slowly developed, homogeneous culture, a nation which has come slowly and only fractionally to mechanized industrialization, naturally retains its traditional methods of artisanship and guards its handicraft to an extent that would seem unwarranted in the United States or England or Germany. Fully industrialized countries, and especially America with its advanced mass-production equipment and methods and with the bent toward "mechanical ingenuity" which had already become conspicuous in the nineteenth-century international expositions, will be best served by a clearer definition of hand and machine functions, and the initiation of the two developments as separate and distinct enterprises.

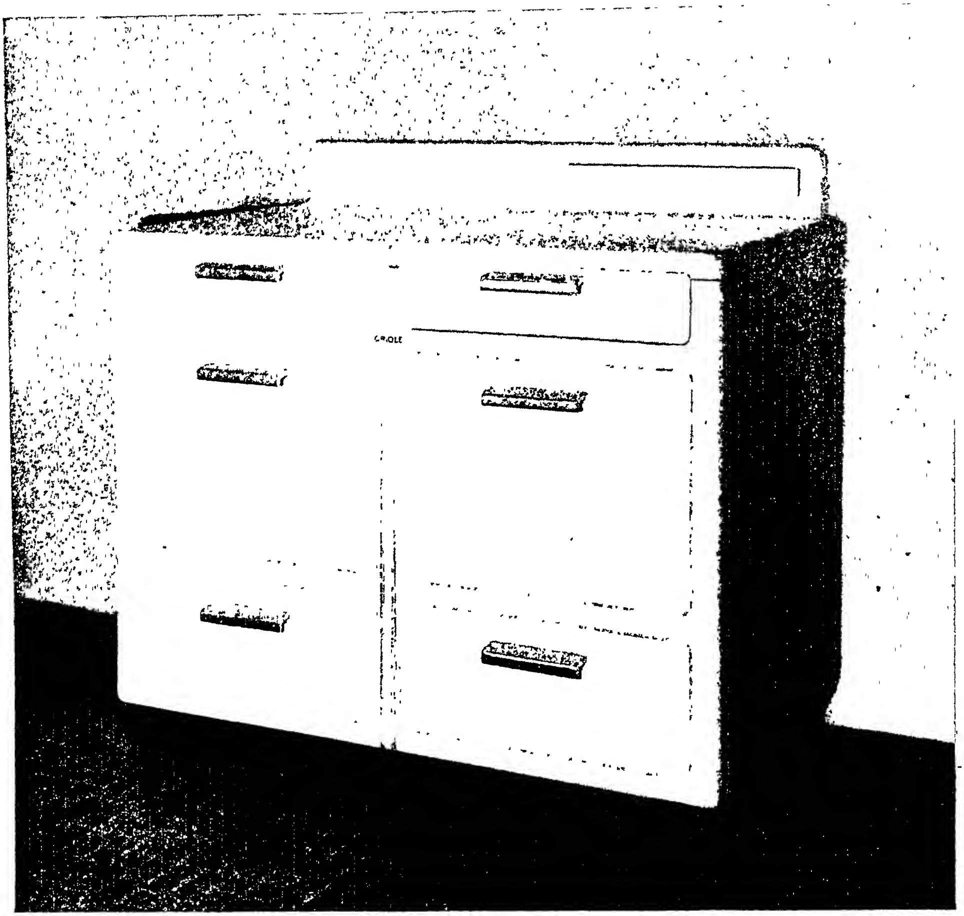
Both the Viennese and the Swedish shops, which have their own beauty and distinction, can contribute occasional objects, gay and charming, to our

sometimes too standardized and somber modern interiors; and we shall probably ask from our own rare handicraft studios (perpetuating, as they do, the finest ideals of the arts and crafts societies which were more flourishing thirty years ago than today) some such contributions. But the matter at the moment would seem to be a minor issue as compared with the task of establishing the new profession of industrial design on the basis of a true machine-tool aesthetic. The first problem is to rid the machine and machine-made goods of the last vestiges of transferred hand-tooled ornament. Then we shall be free to retrace the road and find the ways in which the two may have affinity.

We have given space to the handicraft development and the inheritance from William Morris, then, chiefly to clear our subject of confusion; to note that handicraft survives but along a separate road; and to emphasize again that even the best handicraft ornament is inappropriate in the machine field. Industrial design in America has come chiefly from other sources. Sullivan and Edison, Picasso and Archipenko, Gropius and Frank Lloyd Wright, are influences: William Morris appears only as part of a vague background. The present North European tendency toward a conspicuous crossing of handicraft practice and machine process, however admirably it may act as a purifying, integrating influence on a small, organic national culture such as that of Sweden, would bring only confusion to American industry. We see within it the danger of another century of hybrid ornament such as we imported for our nineteenth-century practice of "the fine arts within the useful arts," and misused on our machines.

It is the new alliance of artist ana macnine, fostered by American industry, which appears as a first step toward a characteristic power-age art. Geddes, Teague, Dreyfuss, Loewy, and their associates among the independent industrial designers are familiarly discussed by European writers on the subject. They stand as type figures because, owing to various causes, there are

in Europe few opportunities for artists to work exclusively for the machine. Without suggesting that the industrial designer is more than a primitive, or that he is more than making an approach to the colossal redesign problem, we consider it significant that, when the call came for an art of design to match the technological advance, there were, in this country, men able to free themselves of manual art tradition and carry machine function, process, and material to a new aesthetic expression.



Gas stove by Norman Bel Geddes. First of the machine-sheer cabinet models. Designed for the Standard Gas Equipment Corporation in 1932.

4. PIONEERS

NORMAN BEL GEDDES opened the first industrial-design studio and laboratory in 1927, and soon found place in the public mind as type figure of an exciting new profession. Walter Dorwin Teague came almost immediately afterward into the field, where he became an equally conspicuous figure. Each in his own way has served industry and the public ever since. The two names are thoroughly identified with industrial-design practice in the broad and general field. The two men are fairly representative of attitudes and ideals that prevail throughout the still uncrystallized activity, and of individual differences in approach.

Joseph Sinel first applied the term "industrial design" to services which he was rendering to industry in 1919, and which he is still rendering. But its specific contemporary meaning as applied to product and to practice came only with the arrival of these new figures. There are other designers who must be mentioned at the outset for the contribution that they make to an adequately rounded-out picture of today's industrial designer. George Sakier, Henry Dreyfuss, Raymond Loewy, and Otto Kuhler are members of the New York group. Donald Dohner, also practicing in New York, made his distinctive early contribution in Pittsburgh. Harold Van Doren, of Toledo, has done much to familiarize the Middle West with industrial-design products, and Montgomery Ferar, now in Detroit, is a promising young figure.

In addition to the central, representative body of free-lance practitioners, of which the work of these men is typical, there are specialists who, while they confine their work to limited fields, are rendering distinctive service for the advancement of the profession. One group, rooted in Modernist architecture, is obviously broadening the acceptance and clarifying the practice of industrial design as it relates to other contemporary design activities. This

they are doing not only by their own creative work in accessories and furnishings, but by their approach to the problems of contemporary building art with the innocent eye of the "artist engineer." William Lescaze and Frederick Kiesler in New York, and Richard Neutra in California are members of a group which will find treatment in a later chapter, devoted to Modernist architecture as a larger application of industrial-design principles: a section going back to Sullivan and Wright as sources, and forward to the homes of tomorrow, where technological developments in the building art are basis of the design.

Another group, composed of interior architects, specialists in the design and assemblage of office, home, or salesroom units, is conspicuous but not always clearly defined. Characteristically, workers in this group base their contribution upon functional elements and invent complete schemes with machine-made materials and forms, and so working they are accepted as members of the profession. They work in response to the same demands which produced the general industrial designer. They often design factory articles of a wide range for use in their own ensembles and for more extensive markets. Silverware, clocks, table and kitchen accessories, and electrical equipment, as well as furniture, are among their familiar products.

The artist who has done most to bridge the distance between interior design (as twentieth-century Modernism's practice of what would formerly have been "interior decoration") and broad design for factory machines is Donald Deskey. Kem Weber, of Los Angeles, now practicing almost exclusively in the field of mass-production furniture design, was one of the first to bring a tradition-free, machine-age creativeness to the assembling of American interior design. Gilbert Rohde, Russel Wright, and Robert Heller are other figures of particular prominence in this work. An additional group, more or less directly out of the movement that produced the modern architecture of Germany and Austria, includes William Muschenheim and

Paul Wiener, Wolfgang Hoffmann and Marianna von Allesch.

George Switzer is an industrial designer who has achieved a reputation largely through services rendered in the redesign of hotel glassware to make it less breakable. Kurt Versen is known almost exclusively for the design of electric lamp and lighting accessories. Wilbur Henry Adams is a specialist in business-office machines and equipment.

Free-lance designers in general and in special fields constitute only a nucleus of the profession which progressively pushes out into all industry's laboratories and pattern shops. There are men still called technologists or engineers who deserve ranking with the generously publicized free-lance figures, if the rules of anonymity of some industries did not forbid—say the creator of the Cord car, or of certain garden tools now displayed in all hardware windows. There are creative artists of equal ability in the style and design departments of furniture and glassware factories, and in plants where prefabricated accessories down to the smallest tacks and screws are being appearance designed.

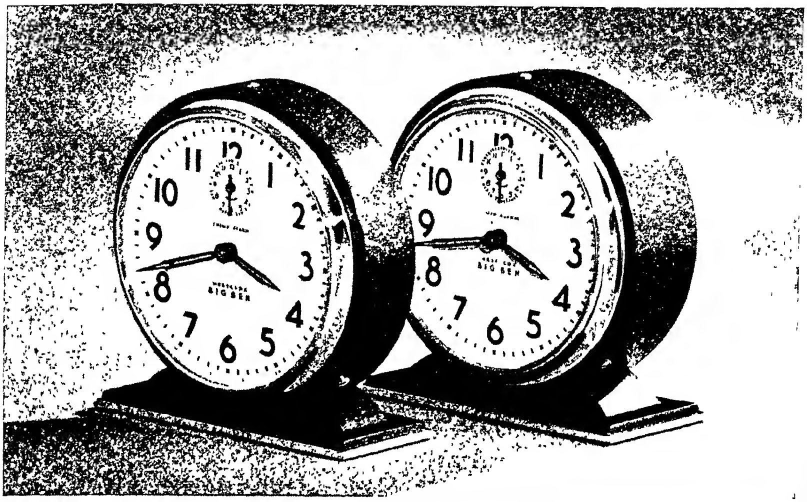
The industrial designer came as a pioneer. After a decade he is still working as a pioneer. There is no central group, with its now established repertory of designed products and its recognized range of practices. There is not even a professional association working to promote the common interests of the practitioners with industry and the public and to establish a code of ethics, desirable as these measures appear. The industrial designer is intensely individual in his attitudes and undertakings. In the same week the public, and most of the other members of the profession, learn from the newspapers that one designer's 2,000-passenger bay steamer is being launched, that the streamlined train of another is on exhibition, that still another has completed the model for a nation-wide chain of offices for a large public service corporation and that the project is considered a highly significant first step in the direction of prefabricated commercial interiors.

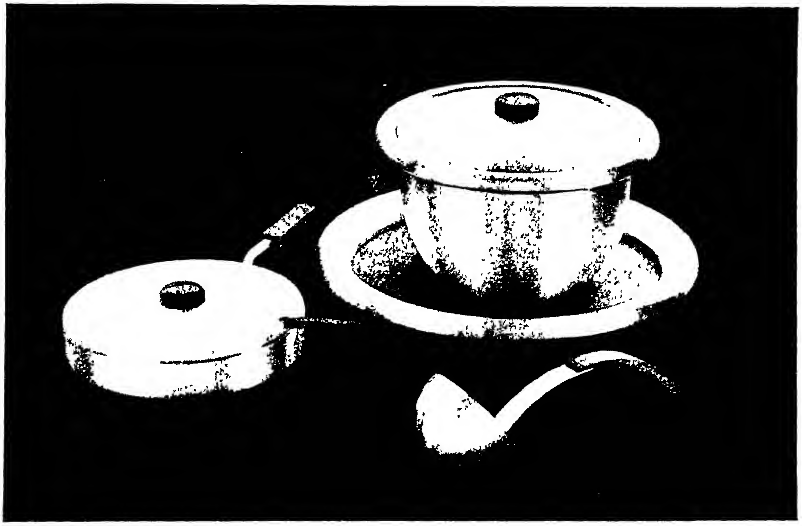
One designer has received a commission to "streamline" linotype machines; another has been engaged, on the basis of work done in the field of colored plastics materials, as color consultant to the largest industrial glass-manufacturing center in the country.

The scope of the general free-lance designer's products may, and does, range from a lipstick to a steamship, from a paper clip to a locomotive, from an ash tray to a model industrial community. Simultaneously in the studio where the drawings and models for the community unit are being produced, a new type vacuum cleaner, a mechanical refrigerator, and a thoroughly revolutionary motor-truck model are active projects.

The training and ability brought to the new field are almost as wide in range as are the products. In the small group mentioned as representative of today's typical producers at the center of the movement, there are men who have practiced as mechanical and electrical engineers, graphic artists and illustrators, architects and interior decorators, museum workers, and theater producers.

In view of such broad and generally unrelated undertakings by men of backgrounds and training so varied, it might well be argued that industrial design is not a profession, but a group of professions. But the basic requirements and the essential definition remain. The industrial designer is the artist specializing in three-dimensional design for industrial production; and the difference between the designing of a city and a cigarette lighter by application of his essential principles and with his characteristic results is one of degree only. Always there is the triple responsibility which is implied in the nature of the service to be rendered: to design what the factory can produce advantageously; to design what the public will accept extensively if not enthusiastically; to design what is acceptable, according to his own aesthetic judgment, as functonal rightness *plus.* Contemporary mass-production economics necessitates that each aspect be given its due consideration; and upon





Common things redesigned. Above, Big Ben alarm clocks, by Henry Dreyfuss; below, spun aluminum stove-to-table ware, by Russel Wright.

this the present stability and the ultimate importance of professional practice would seem to depend.

In the earliest days of the practice, there was overemphasis upon the artist as individual wonder-worker for industry. As one result of ill-advised publicity given to his work, there has been a reaction to the other extreme. Industry, and particularly the artists themselves, tend to minimize the importance of the creative product in their zeal to stress the elements of economy and merchandising expediency. But the balance swings back to the true center because it is well understood that when the industrial designer fails to work as artist he is overlapping upon the province of the engineer on the one side or the merchandise-planning specialist on the other, or he is merely the superficial stylist helping to perpetuate nineteenth-century applied design in a new aspect, providing imitative Modernism instead of imitative handicraft.

Leonardo da Vinci was the industrial-design prototype. The activities in today's laboratories and studios, with their vast ranges of industrial products related to each other only by an affinity of machine-age style, are illuminated more by reference to his work and his life than by anything that has happened since the sixteenth century. He was almost last among the great creative figures who could turn from artist to artisan to artificer to fine craftworker to engineer. He could carve buttons for a Pope's mantle of state, strike off new coins for kings, draw a city plan for Florence, design a chapel and a drainage system, set a pageant in a leafy park devising every detail down to souvenirs for the guests, and anticipate by research and experiment the present generation's findings in the science of aerodynamics, all within the day's work. He was architect, artisan, engineer, research scientist, painter, and sculptor.

Today's industrial designer, by actual cases, sets himself tasks of equal scope and magnitude. He undertakes to extract the utmost aesthetic expressiveness from some small form—a pin tray, an ash tray, a cake tray—not for

the delight of a Renaissance duchess but to demonstrate the possibilities of a new composite metal for mass-production objects. He tests out the principles of aerodynamics as they apply to ground vehicles for fast travel, and the principles of prefabrication economically applicable to low-cost housing under mass-construction conditions. He makes small, exquisite perfume bottles and cosmetics containers, and appearance-designs dirt-moving machinery, street-cleaning equipment, and farm tractors, and stages world's fair exhibitions.

Nothing in the experience of the designers cited provides for a practice including architecture, engineering, scientific research, painting, and sculpture. But the free-lance industrial designer, equipped to handle whatever type of product industry may demand or his own ingenuity may dictate, maintains a staff including architects, engineers, draftsmen, model makers, and merchandise and consumer research experts, often including student workers. He has taken the measure of the machine as producer of his art within a fixed range of limitations. He must be competent and authoritative among the rational facts of product design, supplementing not frustrating the work of the product engineer; he must keep appropriately sensitized to fluctuating merchandise demands and the nuances of public psychology: as in the times of Leonardo, he must use the means of his time, work within the demands of his employers, find assistance where he needs it, and produce as a free creative spirit.

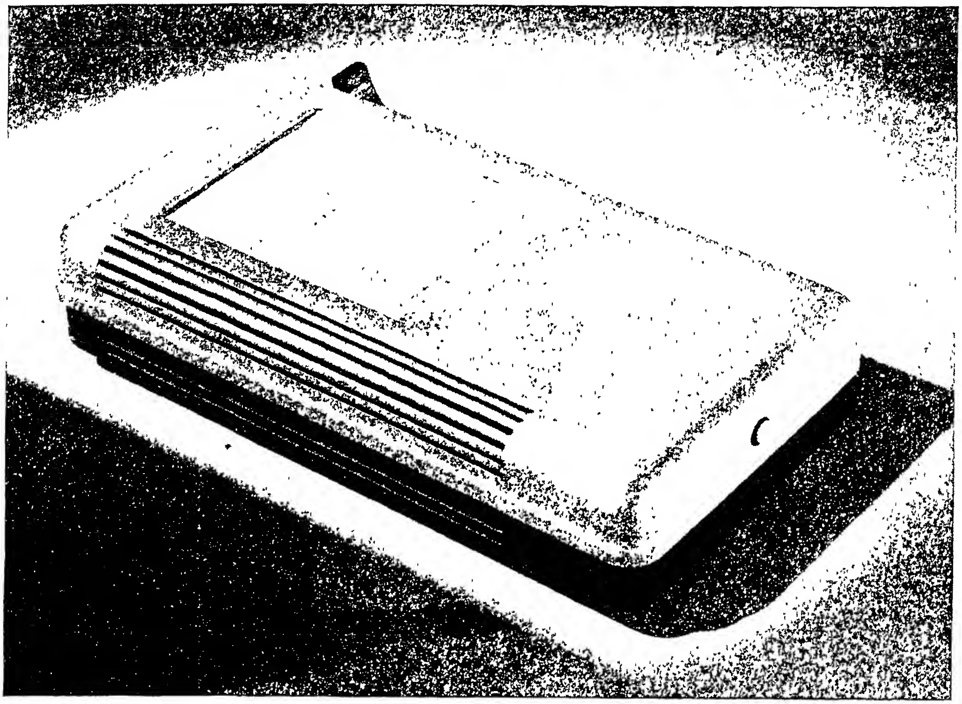
It is only because artists progressively from the sixteenth century absorbed themselves in the scientific abstractions of their art, and progressively lost touch with matters of common importance, that we could ever have had the anomaly of nineteenth-century "industrial art" or retained its confusions down to today. The artist ceased being the artisan, craftsman, artificer, useful citizen; the engineer, the craftsman, the architect ceased for generations to know that art is a living force: we had "fine arts" and "useful arts"

equally a diminishing reality through the centuries that evolved machine-age technology.

Today's industrial designer, who grasps his undertaking with clear perspective, shares with the authoritative writers on the twentieth-century three-dimensional arts grounded in engineering, conviction about his work as a return—not to methods or conditions—but to creative traditions of the pre-Renaissance. Perfectly within the logical framework of the new world which he is himself helping to create, he sometimes avers that we have come to the end of all painting and all sculpture, in the evolutionary stream from the Renaissance: that the creative force is to flow back through the channels of useful things—these ambulances, and grand pianos, and streamline trains, these cook spoons and oil-burning furnaces and machine-age homes and automobiles—before it emerges again under a new configuration, the outlines of which we cannot yet foresee. He believes that Modern abstract art came as a revolt against Renaissance art, from the empty forms of which all vitality had drained out; that abstract art flowed into engineering to produce new useful arts, importantly including industrial design; and that out of these twentieth-century arts is to flower some new kind of creative expression—as strange as was the painting of Cimabue and Giotto to eyes accustomed to the geometric formalities of Byzantine murals.

But to return to the artist as producer, not prophet, to construct a typical figure of the industrial designer as he is today, data from numerous laboratory-studios are to be examined, and ideas, attitudes, and procedures adduced, beginning with the earliest pioneers, Norman Bel Geddes, creative engineer working in terms of large visions and drastic solutions, and Walter Dorwin Teague, industry's businesslike artist-collaborator, the industrial-design profession's ambassador.

Geddes opened his industrial-design laboratory at the age of thirty-three, fresh from triumphs in theater design. He had earlier been successful as

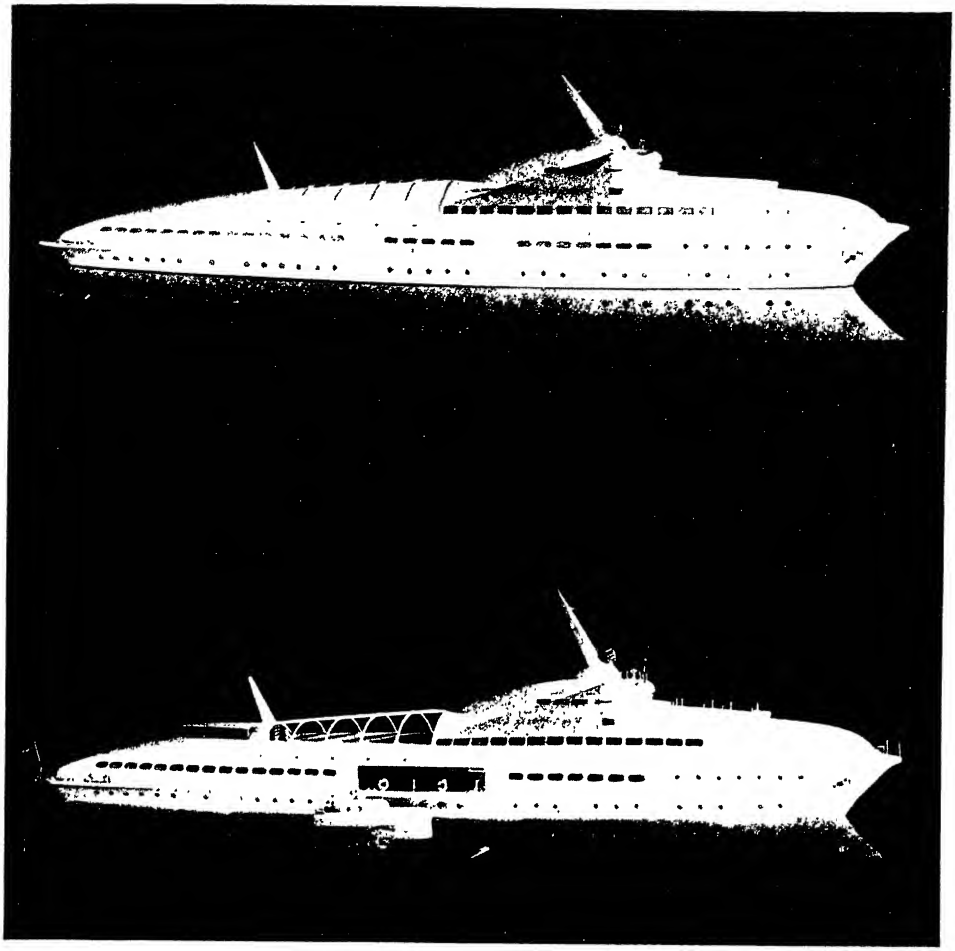


Sales-slip register designed by Walter Dorwin Teague.

advertising director, and briefly as portrait painter. But he had a reputation founded upon original contributions to the stage, a fact noted here because it was based upon the same attitudes and conceptions which are fundamental to his industrial-design practice. "Decoration" as such did not claim his attention. He became engineer and constructor, and thereby broadened the meaning of American dramatic production. But the immense opportunity to serve socially, and the exciting challenge of a new engineering art that might deal in airplanes and ocean liners, in X-ray machines and skyscrapers, drew him, as they were to draw later comers from the contemporary theater and make industrial designers of them. His friends shook their heads over what they considered an eccentric gesture, but presently he was pouring out energy in visualizations of future engineering projects, some of them seemingly a century ahead of any advance logically to be looked for according to industry's current progress; some of them to go into immediate industrial production. There was a quality in all that he did that challenged public fancy and exerted a powerful influence in behalf of the new kind of design that was beginning to claim space in newspapers.

Geddes is an intensely original artist with prophetic engineering vision. He is also a capable executive. At the earliest stages, he organized a staff of fifty, using it for commissioned work, and between jobs for work on large-scale theoretical projects. He is credited with having contributed the word "streamline" to the everyday vocabulary, and with making explicit the streamline as an appearance value, and as a symbol of machine-age style in objects far outside the legitimate field of its scientific application. Also for having contributed, in those early days, the designs which initiated the now general use of sheet metal for Modernist furniture.

It was in his studio that the theories of aerodynamics, then limitedly employed and still not thoroughly understood even in relation to airplane performance, were subjected to research, and the results embodied in fresh



Model of a steel diesel yacht designed by Norman Bel Geddes. The lower view shows all decks opened for normal use and launch door amidships converted into landing platform.

experiments. The models, and the writings which followed, had a revolutionary bearing upon accepted ideas of the automobile, the powered ship, the railway train, and even upon future airplane design. Visualizations and working drawings for a porpoise-back ocean liner, a 600-passenger air liner, a streamlined train, and rear-engined automobiles followed each other in rapid succession, between more immediately applicable designs.

There was the gas stove, which became a legend. It was prototype for domestic appliances, unit-designed, not important intrinsically perhaps, but serving in its own way to bring about unit kitchens. Geddes played out the problem with the elements as graduated building blocks, each block an indispensable stove part, producing finally a new functional and expressive stove minimum. Twelve interchangeable units satisfied all demands that had been met before by a hundred different stove models, and his block-form cabinet stoves, dignified and immaculate, have not been excelled in appearance during the revolution in stove design which has followed. Beds, designed for a leading manufacturer making extensive use of worn-out railway rails, were the product of equally fundamental research in bed history and bed function. Their almost irreducible simplicity and their graceful forms, free of all suggestion of traditional style, account without doubt for the fact that a decade after the first models appeared they are still being advertised nationally by the manufacturer. The extent to which the Geddes experiments in application of streamline principles have influenced automobile appearance is not to be recorded, owing to the design policies in this field. Simultaneously with his early visualizations for future automobiles, he produced the first designs in keeping with what he conceived as "market acceptance." As actually produced, and as modified year by year, they have been an influence upon all automobile appearance.

Norman Bel Geddes does all his own designing, working with voluminous basic data, broad backgrounds, a large engineering grasp. He starts

as if nothing had ever been designed before, freeing an intensely imaginative power upon each detail of the design problem, and working through to a complete visual solution, fixed in form for workmen to take in hand. One may find him intent upon the model for a gas refrigerator, which assistants have blown full of smoke for a study of air circulation, or hung full of thermometers as a test of temperature variations. In keeping with established procedure in this office, and all representative industrial-design offices, records of competitive products will be at hand. There will be records of consumer reaction to equipment of this type: that is, reports made by skilled interviewers on what women using mechanical refrigerators like and dislike in current models. Certainly in this office there will be collaboration at every stage of the designing by women staff members, whose ideas of appearance and efficiency in almost any product are considered important. It will appear here, characteristically, that the exterior design features, chaste and appropriate as they are, have been arrived at out of functional engineering solutions. The interesting broken line of the side panels is arranged to provide air circulation; the large blue disk containing the trade-mark is an automatic door opener. There are new simplifications and new space provisions, and the engineering improvements include an instantaneous ice-ejecting tray feature. An automobile, a motor truck, a vacuum cleaner, new metal products are among current design projects in this laboratory.

Most dramatic among its recent products, perhaps, is the airplane interior designed for the Pan-American transport planes, and now in use in liners including the clipper planes in trans-Pacific service to China. Problems and solutions here were unique. No flying interiors on like scale had been designed in this country. Food preparation in the air had not been extensively planned. Cooking was not considered safe. Passenger comfort for extended travel by plane had not been studied in relation to necessary space limita-

tions, material weights, and other factors. Convertibility in equipment had to be completely tested out.

Safety, compactness, comfort, and appearance have been realized through innovations at every step. All furniture covering and wall covering has been designed with zippered seams for instant removal, for the inspection of construction metals which is legally required at short intervals. Dishes have vacuum bottoms and cling to the tables even in rough weather. And as an instance of the industrial designer's thorough and imaginative grasp of detail, there are the wine lists, made in the Geddes laboratory under strict tests to determine motion-resisting varieties.

Although he works with a smaller staff now, Geddes still pursues the dual-laboratory method of engineering experiment and actual production of immediate commercial work; and he still finds time for work in the theater, where he has designed or produced more than a hundred plays. This fact is instanced to emphasize that it is not what the industrial designer's product happens to be that is important so much as the quality of his intelligence and the scope of his engineering vision. His model for a streamline train, which has been on a shelf in his studio since 1928, was one of the most creative visualizations achieved in its period. His project for a presentation of Dante's *Divine Comedy,* because of the same quality of creativeness, is known to students of the theater the world over, through endless reproductions of the drawings and models. A major example of his actual design work for New York theaters was the creation of the stage, settings, and costumes for *The Miracle.*

In his book, *Horizons,* published in 1932, Geddes suggestively summarizes the fundamental principles of industrial design (broadly including constructivist theater design) and reviews his first five years of practice in the new field. He reiterates today, in slightly changed wording, Sullivan's dictum about form and function, and usefully reminds the reader how far

industrial design has yet to go before it can be said to be worthy of claiming the name of art.

"Function dictates form."

"Design is the organization and the arrangement of forms."

"The modern industrial designer begins as a laboratory student of the inner organism and the practical purpose of the thing he is to design. In all true Modernism beauty finds its origin and its structure in sound engineering, and the nature of materials and fitness to use."

"The underlying principle of the emotional response that the airplane stirs in us," he says, "would seem to be the same as that which accounts for the emotional effect of the finest architecture. When automobiles, railway cars, airships, steamships, and other objects of an industrial nature stimulate you in the same way that you are stimulated when you look at the Parthenon, at the windows of Chartres, at the 'Moses' of Michelangelo, . . . you will then have every right to refer to them as industrial art."

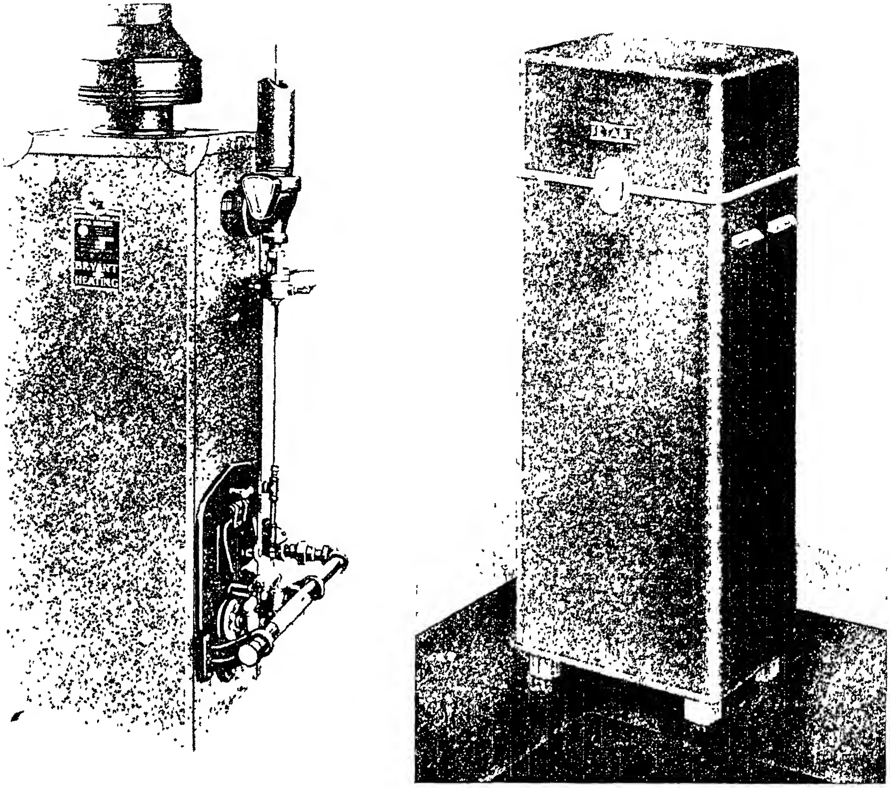
Walter Dorwin Teague has a reputation for an unbroken succession of commercial successes. He is a typical present-day businessman whose business is design, and whose professional pride is in the efficiency with which he manages it. He is a progressive conservative who sits in confidential conferences with the world's leading industrialists, practices in collaboration at times with the most successful architectural leaders of the period, and does design work which is seen and admired by millions.

He had made a reputation in the fields of typographic design and the graphic arts before becoming an industrial designer. His temperament and his method are illuminated by a study of the practice which has grown steadily with always expanding scope, till today his early conception of design in three dimensions as ideally embracing "everything from a match to a city" is on the road to literal fulfillment. His staff of specialists is kept elastic for the successive demands upon it.

The Teague gift of design is peculiarly that of capitalizing the engineering elements that can be made to promote utility with attractiveness. Examples of how this is achieved appear in railway coaches, automobile designs, air-conditioning equipment, and space and water heaters (such as altogether make the contemporary basement space a combined "weather room" and recreation room). At one end of the scale of his design work appear a 600-horsepower radial gas engine and a caterpillar tractor; at the other, there are optical instruments and X-ray equipment. Business machines, salesroom ensembles and exhibition halls, clocks, cameras, and a standardized service station adaptable for use in all parts of the country and in communities of various sizes: these are among the items in an almost formidable catalogue of Teague designs.

Meantime, he becomes increasingly prominent as a specialist in exhibition planning. His flair for dramatizing an industry's efforts in a given direction so that the interest of a wide public is caught and held came into play prominently at the Century of Progress Exposition. The Ford exhibit there was the beginning of his reputation in this field, which has been cumulative through work done on exhibits and buildings for expositions at San Diego and Dallas. As a result, he was the logical man named as member of the planning committee for the 1939-1940 World's Fair in New York, to be responsible for the industrial-design standard in the planning ensemble.

The fact that there is an industrial-design committee member is a matter of moment to everyone in the profession, and to the whole cause of Modernism. It means that for the first time opportunity is offered members of the new profession to participate with other representative creative figures in achieving a unified architectural scheme according to the fundamental principles of machine-age design. A demonstration is being made to the nation, and to the world, of what American industrial design is. Ideally, we are to have a microcosm of the machine-age world, artist-transformed. Architect, indus-



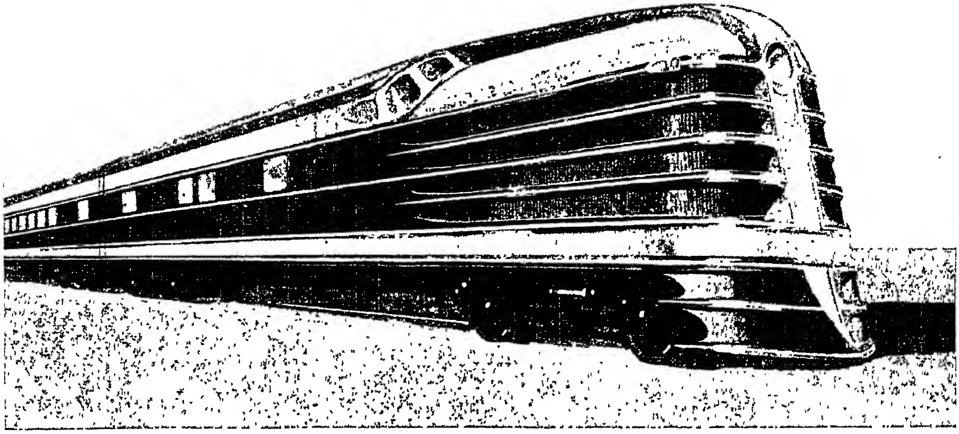
Bryant space heater, before and after an industrial designer took it in hand. Designed version by Walter Dorwin Teague.

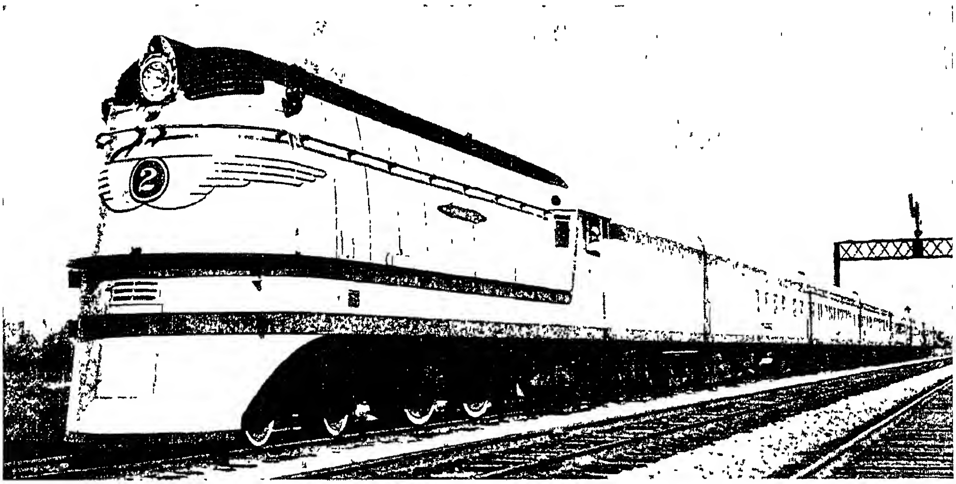
trial designer, and independent creative artist will work together to achieve a complex of thoughtfully conceived units which will appear as one superb spectacle of formal beauty. A repetition of the disunity of the Chicago exposition, and of the tawdriness of certain of its aspects, would not seem possible with one of the foremost industrial designers of America on the central planning committee, and with the now established profession eager to collaborate.

"Everything from a match to a city," then; though one may be sure that Teague will exhibit no sketches of cities he may be planning until construction work is under way. In contrast to Geddes, he distrusts "visualizations" and "projects" and practically never publishes advance sketches and models. For him, the proof is in the thing actually manufactured when it both works efficiently and looks attractive. He has a distaste for the word "beauty," acquired no doubt through realistic contact with industrialists and factory engineers who still recall the flowers and lace that used to be superimposed on practical cash registers and cowcatchers in the name of beauty; who even peevishly complain that "nothing seems safe nowadays from the meddling of the style and color boys." Designers, he feels, cannot be trusted at present, and until there is a better general understanding of the meaning of the word, with beauty.

He is impatient of the too vague and theoretical approach. He sees it as a menace to the opportunity that has come to artists to organize their output and market it in industrial centers. That is a realist's business. Mr. Teague is a realist. If he is temperamentally unable to surrender his artist imagination to the full potentialities of a new artist-and-machine-contrived world, he is none the less working for its realization. And he talks methods, if not theories, starting with the attitude that the design is latent in the thing dealt with, and that it is the designer's job to discover and reveal it.

"Take an analogy from nature," he once wrote. "Let us suppose that





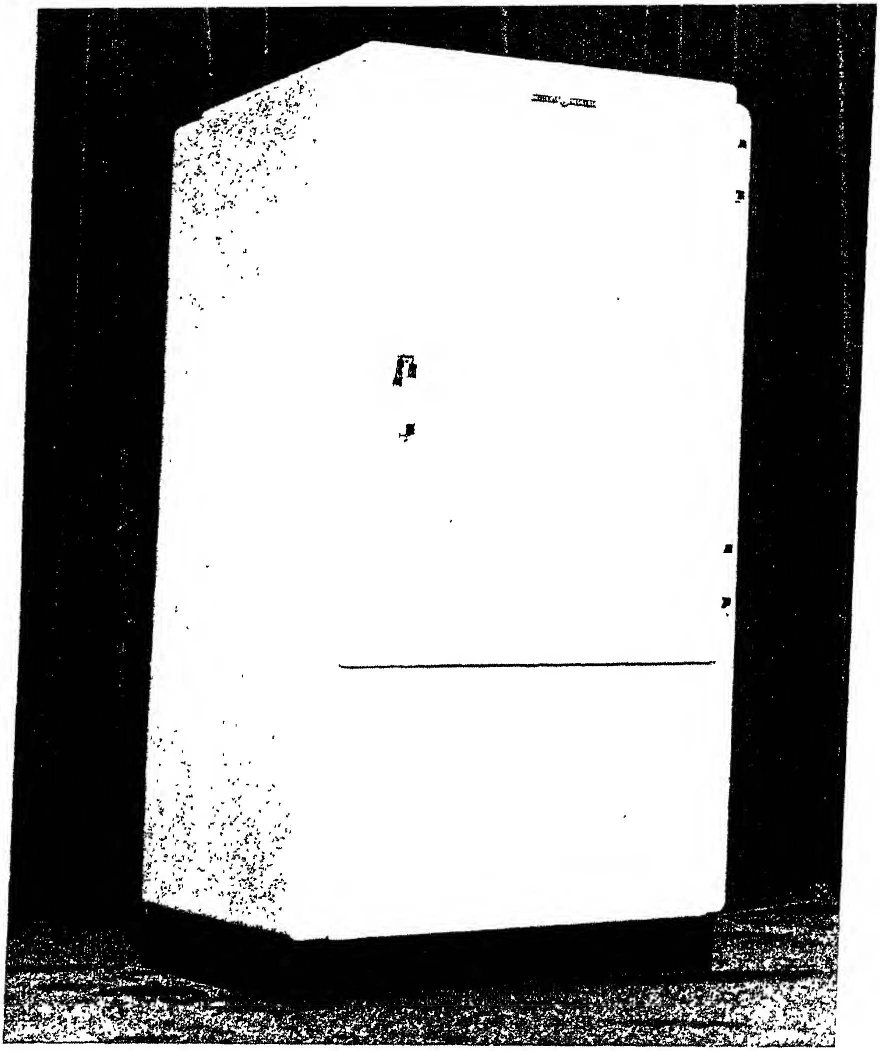
Two train designs by Otto Kuhler. Above, an uncompleted project; below, the *Hiawatha* of the Milwaukee Road.

there had never been race horses, and that some divine designer should set out tomorrow to design a race horse—to take this clumsy, barrel-shaped draft animal with a leg at each corner and work it over so that it could run a mile in a minute and thirty seconds with a boy on its back. Well, being a good designer, he would realize that he must lighten the weight of the barrel and make it more supple, but allow ample depth and capacity to the lungs; he must lengthen the legs and loosen their joints, at the same time developing the muscles of the shoulders and thighs; he must eliminate every ounce of weight that does not contribute to speed; he must put fire and courage in its heart and health in its veins, so that its eyes flash and its coat is sleek and shining. In short, he would design exactly the race horse we know, a creature of springs and nerves, grace incarnate, the symbol of eager life."

Teague has prepared for his clients an "Outline of Industrial Design" worthy to serve as a terse and businesslike model of the designer's service, its aims, methods, and results. The service is summarized as "the organization of a manufactured product to increase its desirability, and hence its sales." The aims are: (1) improved appearance; (2) improved serviceability; and (3) increased economy. He lists the methods, which cover study of operating, structural, and production requirements, and marketing problems (including the problem of competition). The steps in "design creation," as outlined, lead from preliminary sketch to completed model; and characteristically are extended to cover assistance in marketing, including such services as talks to sales forces, and publicity. This outline is perhaps the most concise and objective account of industrial design as a service to industry that has yet become available. Of the foundation of the industrial-design artist's broader service, its author has spoken elsewhere as "the universal human insistence that whatever serves us practically shall also give us satisfaction and delight."

Thus we have the two approaches. One man, Geddes, takes a powerful

imaginative grasp on the machine's problems in terms of engineering invention, lays a vast plan involving many and complex factors, and extracts therefrom the specific design. The other, Teague, equally equipped with research data, equally familiar with the technological requirements of the case, bends his efforts toward achieving the utmost acceptability for the thing designed in the minds of the greatest number of people, to industry's greatest advantage. In both cases, as with other design personalities whose practice contributes to the foundations of the new profession, the conclusions are the same: today's industrial designer is a man of rich and multiphased personality, responding in his own characteristic way to a new demand of his times, with a new kind of artist service.



Refrigerator by Henry Dreyfuss, for the General Electric Company. One of the earlier instances of abstract art principles consciously embodied in a utilitarian design.

5. MAKERS OF A NEW PROFESSION

INDUSTRIAL design has been offered as one of the first facts of a dominant twentieth-century aesthetic destined to issue from new common attitudes and faiths rooted in the machine as instrument of a universal culture. The nature of its distinguishing marks has been suggested. Effort will be sustained throughout to identify them in actual products where they are adjudged most authentic and most expressively realized, and to indicate their affinity with other forms of artist expression in an emergent culture complex, a complex wherein first use and then beauty becomes the reasoned order of the creative output. But there is need for a more concrete account of industrial designers at work than can be offered from the practice of two or three leaders. The story of the profession to date is only to be adequately generalized from a group of representative studio-laboratories, in each of which, as already stated, a dominant design personality is responding characteristically to the contemporary flow of common experience. Much of the progress in all of them is still, obviously, by trial-and-error methods, biased by industrial conceptions of appearance value, sometimes compromised by the conditions of competition in the market place; but it is the ideal, the standard, the whole creative product that is of consequence. The small group of men whose work is discussed here, supplementary to that of Geddes and Teague, are judged to have made, on the whole, contributions without which the present profession would be less adequate and narrower in scope.

"To bring the most out of the machine," is the motto which has placed George Sakier prominently in the forefront with producers of authentic industrial design. It has also been his means of opening a way in industry still unique, but promiseful for whatever younger men bring the same combination of artist sensibility, engineering training, and capacity for patient, progres-

sive effort that is gauged at the level of public receptivity in a given field.

The precedent he has established is that of a man in an executive capacity within industry, dominating the appearance standards of an important range of commodities where every step was a pioneering move, and where his whole contribution now stands out as revolutionary. He has meantime developed free-lance design contacts as a method of keeping a broad outlook and a free conception of industrial design as artist product. Sakier earlier worked as illustrator, art editor, and "decorator" in the tradition of *art moderne* and the 1925 Exposition. He still does two-dimensional design on occasion, and once recently he whimsically styled himself "the plumber who won a national prize for a whisky label." These facts are emphasized because they in turn lend emphasis to the generalization that the industrial designer works with a clear conception of the two separate sets of principles involved in two-dimensional and three-dimensional design. Versatility enables him to shift from the one set of requirements to the other, when he finds it desirable to do so.

Sakier's position is that of director of the Bureau of Design of the American Radiator and Standard Sanitary Corporation. His first work on domestic engineering products for this organization was not industrial design, but engineering design. It was before the mid-twenties, and at the time when a higher quality in plumbing fixtures was being demanded. As that demand was satisfied in the markets, it broadened into a necessity for bathroom equipment designed by artists with regard to architectural style and harmony. During the style wave of the twenties already alluded to as bringing "modernistic" and "futuristic" excesses, Sakier was creating exhibition ensembles as luxurious as any of those advertised, for their "rich and Oriental splendor," for their Greco-Roman "period" authenticity, or for their Spanish exoticism. But his work was always distinguished by a delicately perceptive discrimination and a genuine originality in new material

use. For one $7,000 ensemble he produced an oversize tub with a wide, deep seat built into one end, and with gold taps.

Thereafter, the luxury market having taken its abysmal plunge, he began giving attention to production of a minimum-sized maximum-efficiency "machine for cleanliness"; or, to follow the broader outline of the narrative, he turned from a practice which had continued in the spirit of the decorative arts, and became one of the first industrial designers. What followed was bathroom design of the order LeCorbusier had visualized when he wrote initially of the organic power-age home as a "machine for living." Richardson Wright was one of the few people who saw from the start how Sakier had "extracted the full significance of the Modern movement" (then still in its most irresponsible tentative stages), and how he had brought to it a balance and maturity "which might well instruct designers of many products."

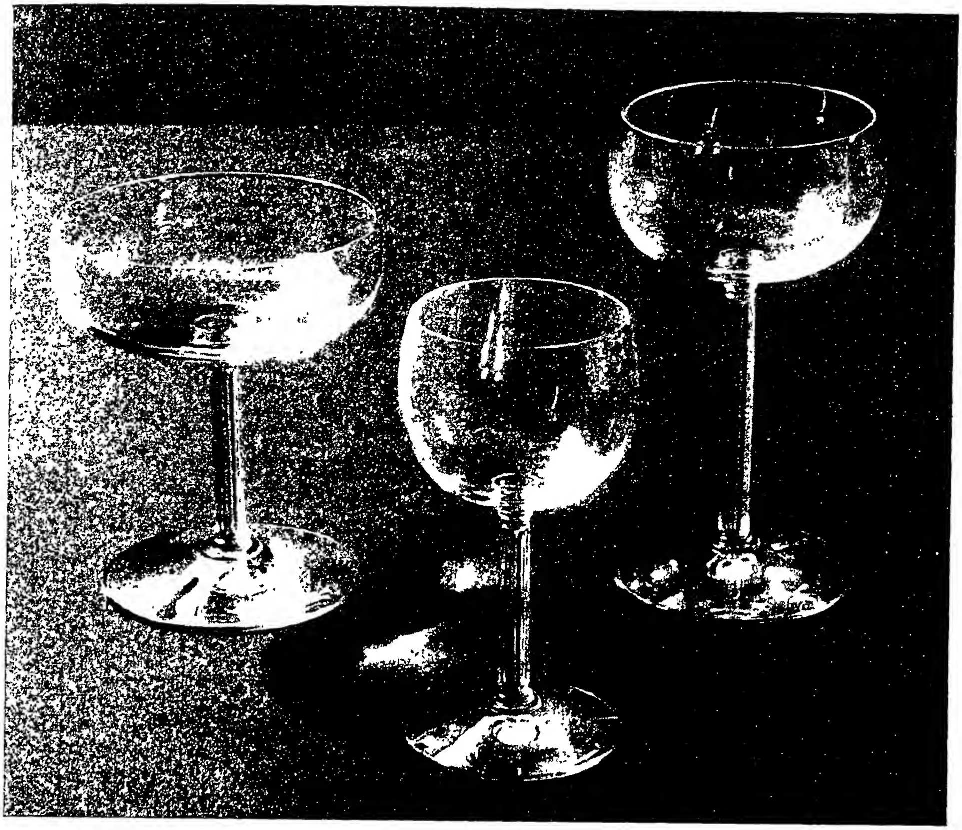
Further simplification of basic forms, with progress toward complete straight-line expression in conjunction with engineering advances, followed, and in 1933 prefabricated bathrooms, ready for installation by units, were released, marking the true beginning of home prefabrication as a mass-production fact. Thousands of the bathrooms are now in use in homes and apartment houses. Prefabrication by panels, and conformity to existing building techniques and existing distribution methods, are among the features calculated to make them a practical manifestation of economic gains, realizable through wider application of the principle. LeCorbusier's "machine for living" was a visualization, a figure of speech from a machine-age Utopia. Hundreds of American commercial experiments have familiarized the public with the idea of ordering "machines for living" as simply as ordering machines for travel. And yet, technologists in the housing field generally agree, no notable beginning has been made toward economically advantageous mass housing through application of the principle of prefabrication.

It has remained for an industrial designer to offer in this relatively small field a practical first step.

In contrast with these large unified design programs which are carried out through a slow development process, there is, in Sakier's list of achievements, the design of glass for moderate-priced tableware. This is one part of the widespread industrial design activity which is introducing a modern art standard to commodities hitherto without appearance standards. Pressed glass, one of the cheapest and earliest products of American industry, takes on distinction, even when marketed in ten-cent stores. One of the tests of its new estate is the extent of its presence in European markets.

What we venture timidly as a theory of industrial design, we find men like Sakier boldly declaring as a method of everyday practice. The artist, he says, starts with engineering elements, and produces his design from them by the same process that results, with more abstract elements, in a typical abstract painting. *Then,* with his finished creation in hand, he is faced with the responsibility for psychologically right timing of the product in the market. Sensitiveness to the cycle of acceptance governing all contemporary design is as much a part of the intuitive artist's stock in trade as is the design technique. In this one studio-laboratory, at least, products are often held for three months or three years, according to whether they are simple articles with brief life cycles in the market, or substantial products of long-time duration, such as a bathtub or bathroom. In any comprehensive development of industrial design as an integral part of manufacturing organization, the intuitive artist-engineering specialist thus competent to pursue the design evolution of new products will be an asset whose value will be difficult to estimate at all adequately.

At a far extreme is Henry Dreyfuss, youngest of the designers to embark upon a free-lance career before the thirties, whose design projects are unpredictable and whose design scope is sufficiently broad to make him a type



Pressed-glass stemware, designed by George Sakier for mass production by the Fostoria Company.

figure covering the whole field of three-dimensional creative design in industrial products, and doing this with boldness, vigor and distinction. Like Geddes, he came out of the new movement in the theater and, also like Geddes, he is still a designer for the stage, but limits his activities in this field to one Broadway production a year. Some of his successes in this field have been outstanding. In industrial design, the abstract and impersonal values of the machine control his designing, but his representative products never stop short of true artist expressiveness. This was made particularly explicit in the Philadelphia exhibition of "Dynamic Design," arranged by Clara Mason and other executives of the Art Alliance some time ago, when a Dreyfuss refrigerator appeared in a setting of machine parts and abstract art productions.

Dreyfuss' office simultaneously produced a new streamlined train and a line of kitchen equipment for distribution through ten-cent stores and elsewhere. Other typical products include washing machines, bathroom equipment, a check protector, a thermostat, clocks, and vacuum cleaners; they range from redesigned paper clips to a permanent exposition for a large industrial producer, from a private airplane interior to a sportsman's watch, with emphasis to be placed on his model Western Union office, as an advanced step in unified chain-store appearance design. (It is true that chain stores had not been conceived as an industrial-design product until this example appeared, but neither had the model bus terminal such as that to be described, or the oil stations, or many other of the numerous new art-and-use creations that are daily emerging. All these may be accepted as illustrating the fact that it is not the nature of the product designed, but the quality of the designer's contribution that counts: it is the Modernist's conception of organic artist design realized out of engineering design.)

The Big Ben alarm clock, an object familiar to millions, was one of the first Dreyfuss designs. It is interesting as having represented the first drastic

experiment in changing the appearance characteristics of a trade-marked, widely advertised product. Subsequent changes in the design of the company's entire output to conform with the Big Ben as industrially designed, and a permanent retainer for the artist as designer of new products, followed.

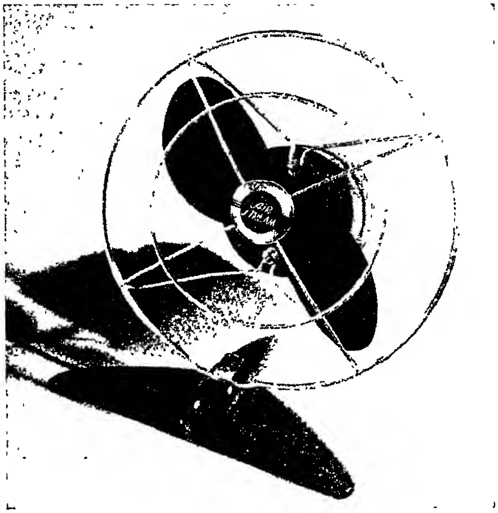
The undertaking to originate designs for a range of small kitchen equipment, including cake turners, beaters, spatulas, ice picks, and a variety of strainers and spoons, involved a pioneer effort to harmonize a wide line of inexpensive standard utility articles. How some fifty articles may be modernized and given a common design character is a point elucidated in these new products, where often functional gains are realized, and the whole effort within the initial requirements that nothing done by the artist should increase former production costs. The contours of the spoon bowls, the simple, effective perforations (varied according to function), the fresh bright colors in which the line now comes, including a new kitchen color, canary yellow, the carefully studied handle forms, are among the design values realized.

The order of the procedure in this design project was determined by the artist's intention to achieve (1) practicability from the standpoints of manufacturing and merchandising, (2) the dramatic touch, and (3) design which will appear fresh and appealing tomorrow as well as today. When such procedure is followed by a man who is primarily an artist of integrity and ability, competent to work realistically among twentieth-century mechanical facts until an aesthetic equation results, industrial-design products follow with the quality common to these spoons—at one end of the scale—and to the streamlined train designed simultaneously in the same studio. How the dramatic touch is realized is illustrated eloquently in the locomotive of this train, the disk-form wheels of which are floodlighted so that the observer of its passage through a dark countryside receives vividly the impression of speed and power embodied in a form abstract and majestic. This is perhaps the most intense visual presentation of an engineering fact yet to be made by

an industrial designer. It could have been made in this particular form only by a man skilled in the art of vitalizing theater material until it lives for the audience within the three-dimensional world of the modern stage.

Other men, following the same procedure, often produce work with less sheer-form expressiveness, but with its own integrity under the definition accepted for industrial design and equally significant in the fields of engineering-art and improved merchandise. Harold Van Doren, commonly credited with having introduced industrial design into the mid-West, is one of them. He is endowed with artist sensibility in the new impersonal and scientific significance of the term. From a background in authoritative Modernism brought from the museum in Minneapolis, where he was assistant director, he has served industry in progressively confidential relationships, first in partnership with John Gordon Rideout and then alone in Toledo. Radios and kitchen equipment, laundry and heating machines, exquisite little perfume bottles, automobile tires, a gasoline pump, a long line of streamlined juvenile vehicles, are but items in the steady flow of designed products from this studio, where meantime in response to opportunities felt to exist in an industrial region, larger and more continuous activities were undertaken. The breaking of fresh paths in two different directions claims mention, particularly because it has led to two new fields of industrial-design specialization which are beginning to assume major importance, to industry and to designers. One of these is appearance design for heavy machinery. The other is work with new materials and product design for such materials.

The theory of factory machines as appropriate subject for the services of the creative artist represents a broadened application of the conception which led to artist design in the machine's products, that whatever makes for efficiency and economy makes for right appearance also. Fundamental simplicity for heavy industrial equipment was already an ideal in some impor-



The airplane form consciously borrowed as an appearance value. Above, a fan by Robert Heller for the A. C. Gilbert Company; below, a metal "coaster" by Van Doren and Rideout for American National Company.

tant industrial centers. But the design which goes beyond what the engineer contributes to the mass-produced object began to call for extensive factory retooling, and brought in turn the new opportunity. Harold Van Doren, intuitive and technically sound artist, was on the scene at a psychologically right moment for exerting an influence upon the theory and the practice of appearance standards for industrial equipment and factory machines. The manufacturing company for whom he had done some of his earliest product designing retained him to work in close association with the architects of its new plant, industrial designing the plant interior and the machine tools. Among his contributions to this field is a complete line of factory machinery used in the automotive trade.

"Nobody expects a lathe or a planing machine to look like anything but a lathe or a planing machine," he says. "But I have yet to see any kind of machine assembled from many parts which could not be improved in its unity by the industrial designer who knows how to lead the eye from place to place, to simplify and emphasize, and make it seem the best machine of its kind ever built—the aristocrat of all such machines!"

Van Doren was the first man we know of in America to go extensively into experiments with new synthetic materials (known under the group name of "the plastics") with the purpose of applying to them the scientific principles of modern color, as the artist understands them, and the principles of color standardization as required in modern merchandising practice, and finally of originating timely and appropriate products suitable to production in the materials. On the basis of industrial records thus achieved, Van Doren was retained as color consultant to the largest manufacturers of plate, laminated, and architectural glass in the country, to render in that new field services similar to those outlined—an interest which he will follow without prejudice to his general practice.

Montgomery Ferar, practicing in Detroit in partnership with Carl W.

Sundberg, is experiencing a demand for industrial-design services in these two fields. That is, in the mid-thirties, leading industries are going outside seeking the services of specialists in modern art values as applicable to new materials and products and to heavy machines, a fact which would have appeared incredible as recently as 1930. There is a premium in centers of manufacturing activity for designers who can discover new and productive means of using new cheap materials, with the equipment already owned, because along the line of production versatility many industrialists see increased economic stability.

"This significant demand is a challenge to the designer," Sundberg and Ferar are finding, "because it necessitates a broad and empirical knowledge of engineering and of production processes." The firm designs business machines, refrigerator parts, automobile accessories, and small products in wide range; also heavy industrial equipment. Ferar is an architect of depression vintage, graduated from the Massachusetts Institute of Technology and, in 1932, granted a travel fellowship in architecture by that institution. Study in Europe, especially in France, Germany, and the Scandinavian countries, sent him home filled with a faith in the future of American industrial design and his ability to contribute to it.

Donald Dohner may be bracketed with George Sakier, Harold Van Doren, and the newcomer, Ferar, as forming a group which tends to identify its professional activities with certain industrial problems or possibilities, and to work progressively from a given point. The generalization cannot be pressed to include the scope or nature of the design services or the relationship to the industries involved. It can only be taken as one of the indications that in the future development of the profession there will be ample room for original, creative specialist designers too broad to be subjected to routine, and that industry will find their services increasingly profitable.

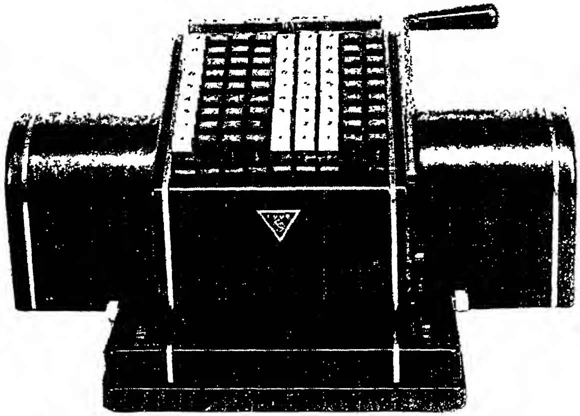
Dohner became director of art in the engineering department of the

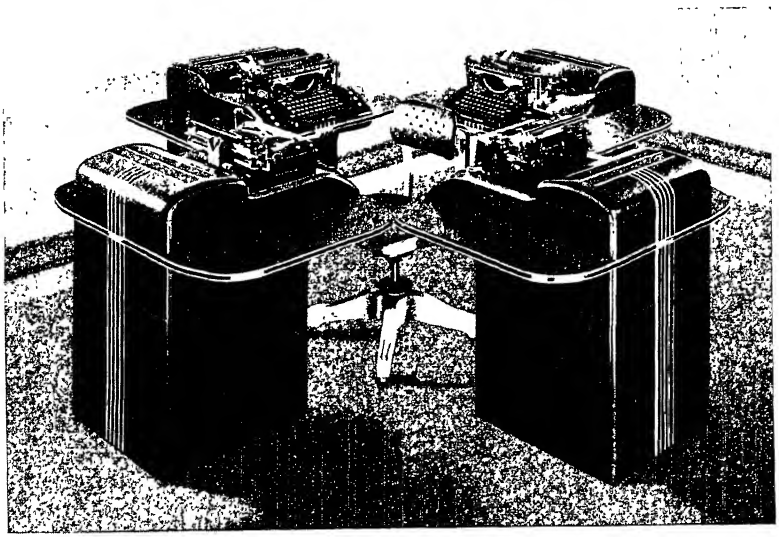
Westinghouse Electric and Manufacturing Company in 1930. He had already acted as art consultant to the department for several years while teaching industrial design at the Carnegie Institute of Technology. His earliest staff work was on two sets of problems of widely divergent scale, the locomotive and the photoelectric cell. He conducted wide experiments in new material uses and achieved notable engineering solutions, particularly in the field of familiar electrical appliances. When economic conditions in public-service-equipment fields caused the Westinghouse company to discontinue the services of an engineering staff artist, Dohner actively entered the free-lance field. He has been responsible for more than 150 industrial design products, from heavy power-plant equipment to X-ray appliances, working always by "application of the principles of the visual arts to the planning of the appearance of articles to be produced by machines."

It is worth noting that Dohner divides the design function into two parts, conceiving *rational industrial design* as all that precedes the drawing-board or clay-modeling stage, and *aesthetic industrial design* as "the forging of all tangible and intangible elements into beautiful, concrete utilitarian forms that satisfy demands in their broadest aspects."

Raymond Loewy and Otto Kuhler, both engineers, the one French, the other German, have been conspicuous contributors to the development of the streamline train in America, while designing in a wider field.

Raymond Loewy, graduate of the University of Paris and a man who achieved almost spectacular prominence as a modern advertising illustrator in America in the twenties, is a brilliant, versatile producer with a range from lipsticks and cosmetic kits to trains and a steamer. An atmosphere of Parisian luxury clings to his smallest product—as to his penthouse studio, where it persists in spite of the vigorous dynamic visualizations of future travel machines of all sorts which line the walls. From many points of view he is one of the most engaging figures in the profession. He rides in the



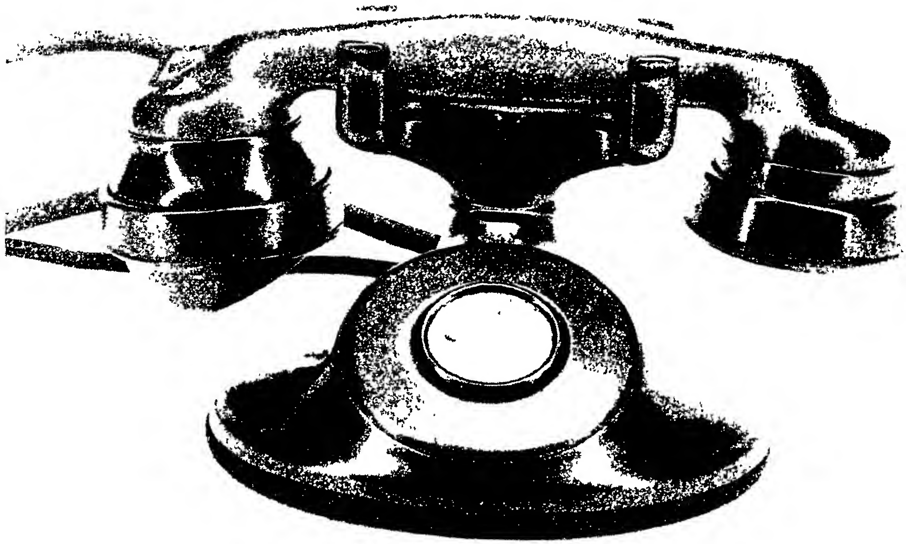


Two artist-designed office machines. Above, Todd check writer by Henry Dreyfuss; below, a group of Robot-Typers by Otto Kuhler.

cabs of speeding engines making wind-direction tests with waving threads. He plunges into the vitals of locomotives. He retires to some center of aeronautical engineering to emerge presently with suave models for future locomotives, turned by a hand sensitive to aesthetic form. He works with a staff of a dozen people in his New York studios, and maintains offices in Chicago and London, turning out design products in as wide range as any worker in his field.

In contrast, Otto Kuhler's industrial-design activities stem from professional preparation and wartime activities in the building and operation of railroad lines, and from supplementary experience in the design of custom-made automobiles. He was well equipped to work as consultant to railroad executives when the problem of modernizing and streamlining trains first presented itself in this country. Although he has designed in the field of small products and business equipment, his work as artist comes into fullest play in transit and traction equipment, trolleys, and steam and diesel-electric engines and trains. Kuhler's decision to become an industrial designer, when formerly he was a substantially grounded engineering specialist on railroads, goes back to a wartime reason which he states with a poignancy and challenge that are not without pertinency in an account of the coming of industrial design:

"I had, even as a young student, the idea that there were many things in the machine-age world that the manufacturer could make more attractive to the man in the street if he would permit the creative artist to look over his shoulder while he was getting ready for production in the factory or the machine shop. After four long years of war, during which I was eyewitness to wholesale destruction, I began to realize that I was not alone in my eagerness for more beauty in everyday life. Everyone was coming to realize more or less the need that the years of gray and devastating death be forgotten in new brightness and color and light if civilization was to go on.



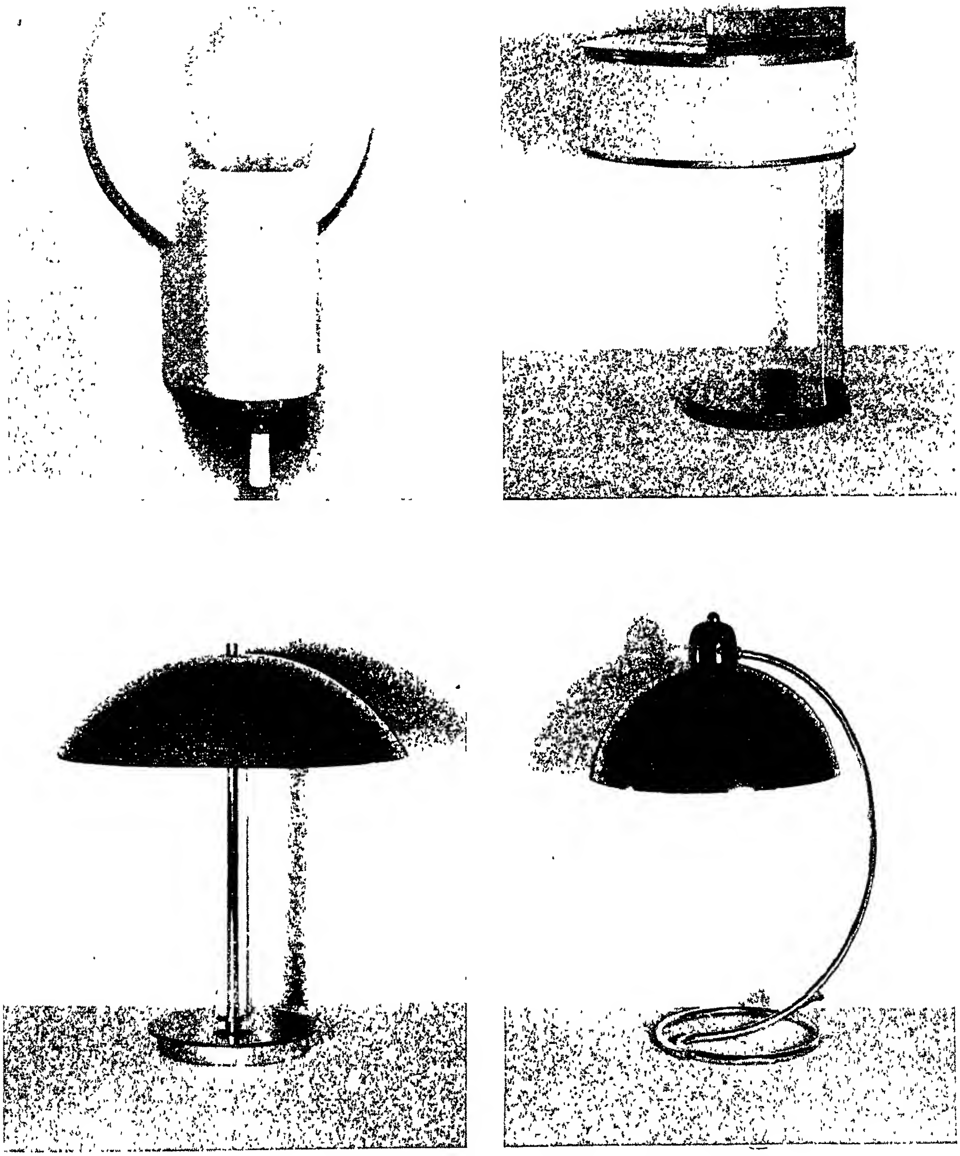
Current model of the desk telephone set. Designed by engineering-design department of Bell Telephone Laboratories, with aid of an artist-consultant and an advisory committee of artists.

That is why industrial research faced with the necessity to explore markets and materials presently uncovered astonishing demands. War departments of the nations of the world were no longer industry's big customers. The man in the street was the person to be reckoned with. He wanted the bright, beautiful, appropriate fixtures for a new peaceful life."

Such are the conceptions and practices of a few representatives of the profession. A casting up of the original and dynamic resources of their combined studios—and the studios of which they are representative—reveals powers adequate to satisfy all demands of a triune use-art throughout the range of mass products. What appears most vitally needed is clarification and broader public grasp upon what constitutes valid industrial design. When the best resources of the creative figure are properly taxed by industry—again in response to felt public urges—the present large volume of cheap and superficially styled merchandise (which is now a product of many design studios, including those of well-rated industrial designers who frankly "face-lift" as an interim activity) will drift into the discards. Authoritative journals in class-products fields are beginning to foresee this drift, and relate it to the correspondingly favorable performance reports of commodities industrially designed according to the right definition of the term.

The dominant figure industry is coming consciously to need we may venture to sketch in briefly, on a foundation of the attributes and achievements of today's studios, and the elements of design practice outlined:

He will be an artist of acute sensibility, no longer confining that sensibility within the range of official art or Renaissance traditional values, but concentrating it intensely upon problems of concrete, machine-age use-form creations. If he is not an engineer by training, he must at least provide himself with the technologist's resources for collaborating with product engineers, fruitfully and economically, making his art an effective reinforcement and extension of their engineering. If he cannot do this he will make a better



Lighting equipment redesigned by the artist-engineer. A wall fixture by William Lescaze, manufactured by Pass and Seymour; three portable lamps by Kurt Versen for Lightolier.

abstract artist in the tradition of Leger or Duchamp-Villon than industrial designer in the field opened by Geddes and Teague.

He must contribute merchandising values as well as mechanical and aesthetic elements; that is, he must know what the public is going to find acceptable, say the week after next or the year after next. Fortunately this is possible alike to the man who works creatively and intuitively and to the man with a scientist's approach, through a sixth-sense participation in public psychological reactions such as all artists have to some degree, or through forecasts based upon a complex of social and economic data. Most industrial designers utilize both; and in the new profession of "consumer engineering" described elsewhere, we have the beginnings of a service which promises design programming outlines combined of speculative of scientific material.

He must be an executive, particularly if he is to dominate the evolution of new products, and keep them correlated with industrial and merchandising requirements without unduly compromising their design integrity; more particularly if he is to free-lance over a wide product range. In either case, he will, most profitably, maintain a confidential but independent relationship with industrial executives. He will have use for all the ability he can extract from such specialist assistants or collaborators as his projects may require. He must know how to deputize, indefinitely, without compromising his position as controlling designer.

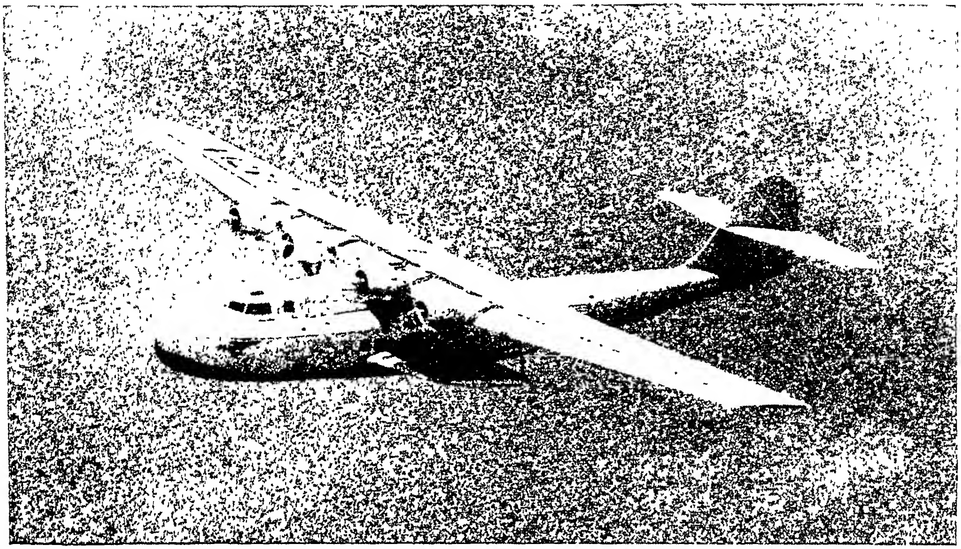
It is not difficult to see how such a figure would be made responsible for carrying out great original schemes and keeping them within the range of industrial feasibility. He would have the resources to set up a permanent exhibition dramatizing an industrial, educational, or public service; to create a model community, including the individual areas and buildings; replan the waterfront recreation and traffic facilities of a great national resort; or produce a streamlined passenger ship as revolutionary in its field as was the first

streamlined automobile. He could collaborate importantly in achieving a new design character and design unification in a world exposition. And none of these undertakings would be found to have dulled his enthusiasm for the design or redesign of small useful products; no more would continuing experiments with the combined economic and aesthetically expressive uses of not yet completely tested new materials, whether of the range of metal alloys, plastics, or glass, concrete, or terra cotta.

Broader understanding of the nature and potentialities of the new worker by industry cannot fail to bring increased reliance upon him for long-range and daringly creative contributions. Future design studios may be expected to go further in the field of pure mathematics, which Geddes explored, and to bring back and reduce to further industrial design equations principles such as that of the streamline applied to all fast-travel mechanisms. Others may be expected to have deputized to them vast production projects. Meantime there is already demand for men of lesser scope competent to design under direction within industry.

Occasionally, viewing this new citizen of a realistic machine-age world, we recall the reflections of Elie Faure, when he brooded over the phenomenon of Cézanne, Modernism's great primitive:

"He is in accord with the secret rhythm of his century; he is urged on . . . by profound forces of which he is no more conscious than were the masons of the last Romanesque churches whose nave was suddenly to leap, lighten, elongate, and hover like a wing over the generation that was arising."



The *China Clipper,* Glenn L. Martin plane now in trans-Pacific service, with accommodations for forty-three daytime passengers or eighteen sleeping passengers, in addition to crew of seven, and cargo. *(By courtesy of Aeronautical Chamber of Commerce.)*

6. THE STREAMLINE AS SYMBOL

AS the trans-Pacific clipper melts into a cloudy sunset out over the ocean with passengers and mail for China we watch aware of the most triumphant manifestation of aerodynamic science applied to utilitarian ends. As an unbroken stream of motorcars glides by, all colors, all sizes, all models synchronized to one regular rhythm on a long stretch of pleasure parkway, we see the same principle brought down and applied to produce all the lightness and swiftness of the airplane that are appropriate to land vehicles. As fleets of high-powered, smoothly operating busses go roaring along all transcontinental highways, and bright bodies of even more efficiently operating long-distance motor trucks pour into view over a hilltop, making one of those moving patterns of dynamized form that contribute a factor to our new aesthetic of common things, we are reminded of the menace to the railroads as carriers of passengers and freight. We are thrilled to be eyewitnesses to a battle for supremacy between two types of common carriers, as one epoch of railroad domination ends and another begins to be established, seeing historic significance in the struggle: a struggle which is intensified in its dramatic aspects because high power is no more powerful a weapon than is expressive form, because efficiency will be no more a determining factor than appearance—which results from *industrial design.*

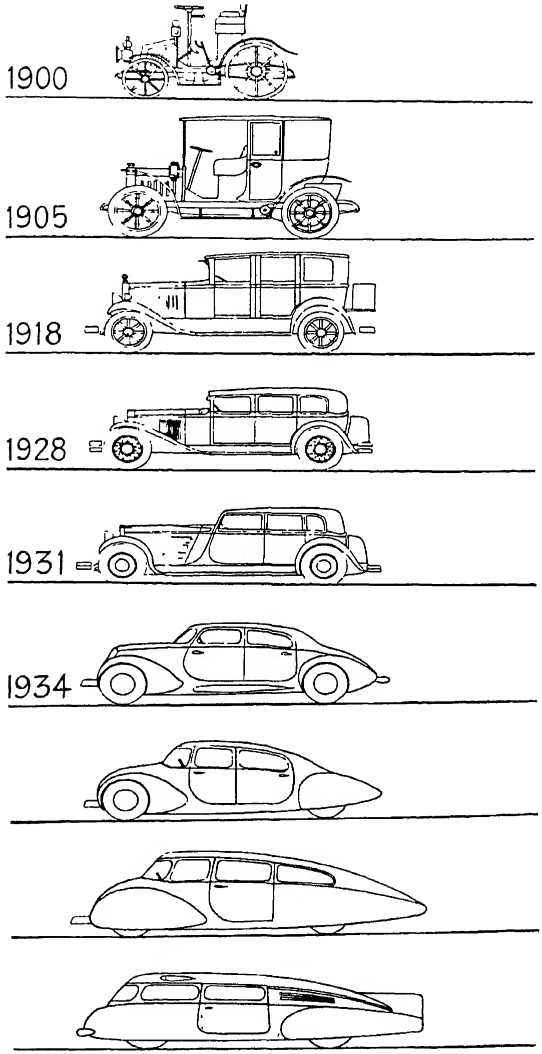
Everywhere, through the air, on rails, by land and water, there is the established point-counterpoint rhythm of smooth, gliding, mechanized travel, making its appeal to the senses as power dynamized, dramatized. We live in a world of streamlined vehicles. The streamline as a scientific fact is embodied in the airplane. As an aesthetic style mark, and a symbol of twentieth-century machine-age speed, precision, and efficiency, it has been borrowed from the airplane and made to compel the eye anew, with the same flash-

and-gleam beauty reembodied in all travel and transportation machines intended for fast going.

If, since 1933, the term has threatened to become an abomination by its ill-considered application to short fiction and false teeth, wastebaskets and underwear, that is only another of the evidences that we still have superficial stylists eager to capitalize the new slogan and misapply the new idiom, and make of them a fad of the moment. There are always superficial stylists. But seeing the trans-Pacific clipper in full flight, and responding as we must with a feeling of aesthetic pleasure for the beauty of its design, feeling the echoes of its flight rhythm in the bright projectile forms of thousands of motorized machines, we can realize how, as new time-space equations are adduced from new mechanically realized rates of speed in all living, we arrive at a new consciousness of form values. We subjectively accept the streamline as valid symbol for the contemporary life flow, and as a badge of design integrity in even smaller mechanisms, when it emerges as form expressiveness.

Just what is the streamline? The early airplanes did not have it, though Leonardo da Vinci is understood to have come close upon the theory underlying it, and to have made researches basic to its ultimate realization. The Wright "aeroplanes," first heavier-than-air machines to make successful flight, had, in 1903 and through the succeeding years of demonstration flying, the form of a big box kite, safe for flying but dangerous for landing. By degrees scientific experiment yielded nature's secret of overcoming resistance offered to a form moving through a fluid medium such as air or water. The porpoise, small fish, and falling teardrops were subjected to prolonged study in the process, after they had been determined upon as the most triumphant specimens of gliding forms in nature.

The British admiralty isolated the Newfoundland shark as representing the swiftest and most efficient swimmer, and developed seaplane models patterned on its form. German engineers, refining upon basic-form experi-

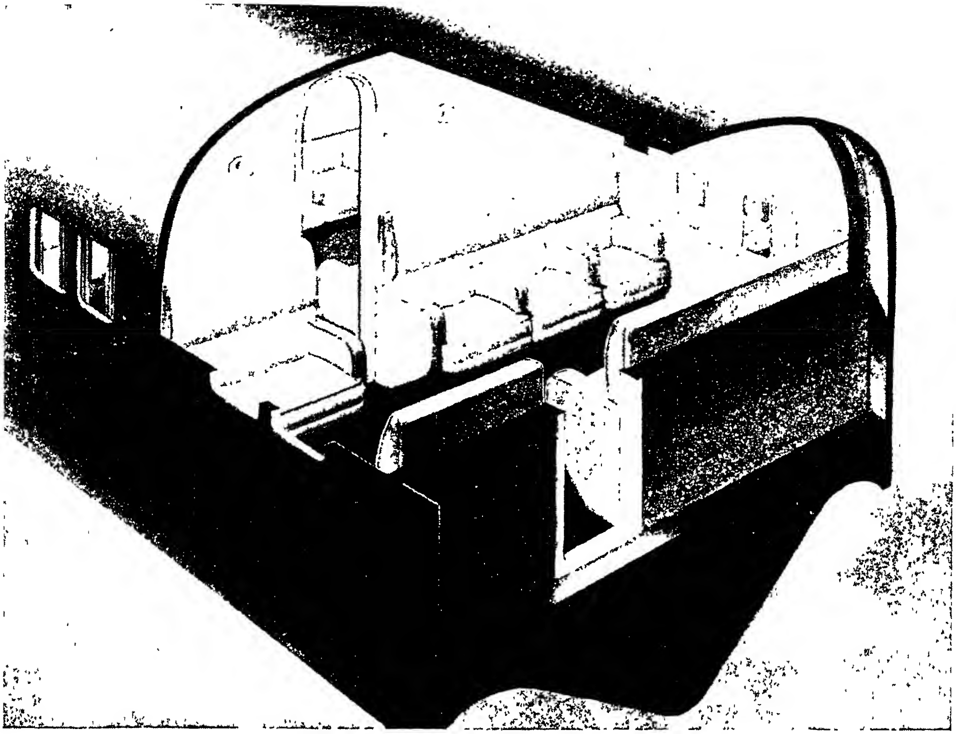


Evolution chart of automobiles, by Raymond Loewy, indicating design trend toward simplification, sheerness and horizontality.

ments made in various countries, discovered that corrugations in the powerful Junkers airplane body metal, and even interlocked seams, disturbed the equilibrium and interfered with precision performance in fast flying, and made advances contributing to the present sleek unbroken-surface plane forms, from which even minute irregularities such as rivet heads have been designed away. Thousands of official and scientific experiments yielded the two main aspects of streamline flying design as we know them: (1) the ovoid gliding form, and (2) the smooth, continuous surface. Where the porpoise and the fish suggested the airplane's proportionings and its functional form characteristics, and consequently its appearance, these proportionings and this functional form were found to parallel also those of the teardrop, as reanalyzed in the course of experiments in applying the airplane's principles to the automobile and certain other vehicles of ground travel.

As principles deduced from mathematical theory were verified in laboratory experiments, used for building models that could be tested in wind tunnels, and finally incorporated in machines that could be observed in flight, aerodynamic laws were formulated. A smooth ovoid form is now well understood to be followed by a minimum of air turbulence and resulting destruction of flight efficiency. Conversely, bodies without rounded form are always followed by air agitation when in motion, a condition greatly intensified as speed increases. Irregularities of body surfaces provide their own secondary wind eddies and partial vacuums, also expensive in terms of speed and power.

Norman Bel Geddes made the only fresh definitive researches we know of in streamlining as applied to ground vehicles. They were basic to the laboratory experiments in which he investigated "parasite drag" (his apparently original term for the sum of air-resistance influences in any instance). His early visualizations and models of automobiles, ocean liners, and trains—and also of future aircraft—were the result, and were the means of the word



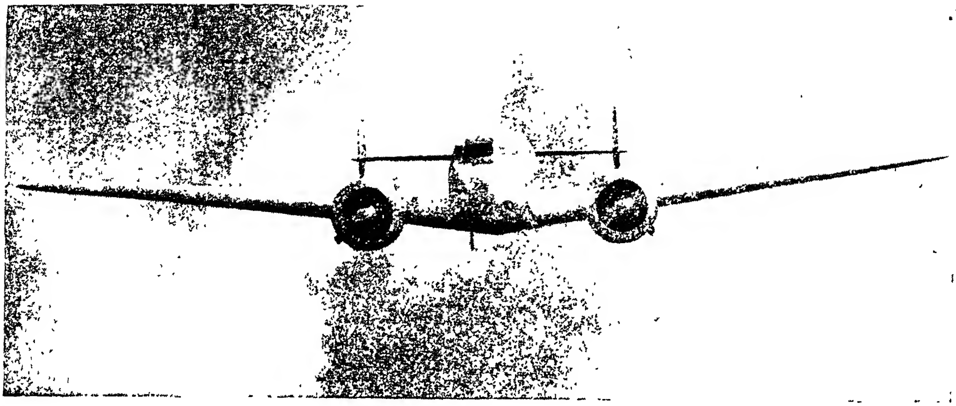
Opened view of interior of Pan-American Airways clipper plane, by Norman Bel Geddes. Coverings of ceiling, walls, and furniture are instantly removable by zippers, for frequently required inspections. New economies in space, weight, and time of conversion from daytime to sleeping requirements. This interior, representing a notable advance in flying comfort, has now been introduced into the *China Clipper*.

"streamline" passing into the common vocabulary, where it is understood as a scientific and an aesthetic principle.

But when the oil-burning furnace, the pencil sharpener, the typewriter, and the electric iron appear as the valid, characteristic products of today's industrial-design studios, and are presented to the public as "streamlined," we know that another definition of the word is implied. We see a functionally formed useful product,smoothly encased in some bright machine-age material, chromium or glass or a plastic substance, corners rounded off, projections sheared away, and a resulting new appearance of simplicity, efficiency, and attractiveness—qualities of airplane form. We are reminded that here, in its own smaller and often more menial form, is a commodity that has taken on the airplane's service characteristics, and with them, strikingly, its peculiar and appropriate kind of beauty. The machine-conscious mind begins to relate all such products of scientist-artist design back to the most conspicuous symbol and inspiration of the age, as the reverent medieval mind related everything to the symbol of the cross.

Streamlined automobiles and trains as they appear on all sides came as a part of the tidal wave of "eye appeal" and styling of the twenties, and have repeated exactly, in the wider and more slowly developing cycle of expensive, heavy products, the movements which brought industrial design to the fore as a new artist-technologist profession. That is, they were not seen at first as implying a revolutionary engineering advance, but rather as products, already efficient perhaps, but subjected to a little style and color treatment to increase their attractiveness to the public. In both fields, of automobile and train design, industry thus at first applied milliner's touches not closely related to the revolutionary progress being made concurrently in engineering laboratories, and also, independently, in a few industrial-design studios.

Today the results of that progress are apparent. As in the general field of mass products, industry, the engineer, and the artist-designer are at least

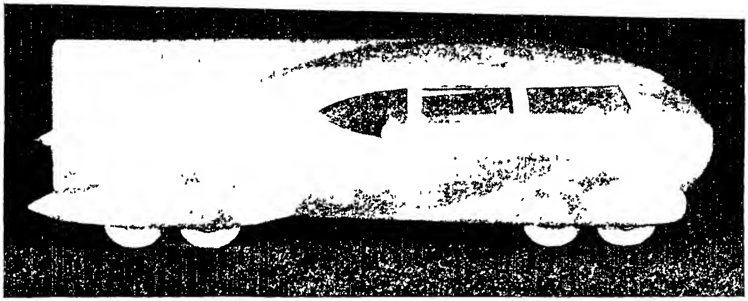


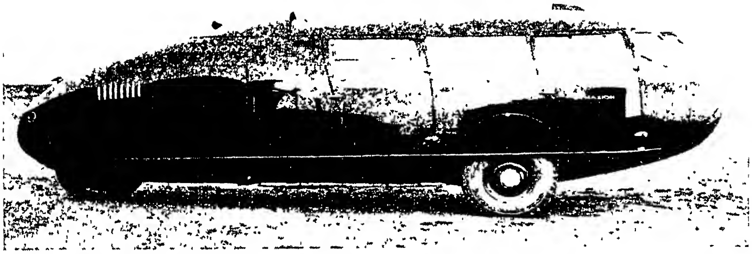
Above, a Lockheed Electra low-wing monoplane, indicating source of streamline idiom in travel-machine design. *(By courtesy of Aeronautical Chamber of Commerce.)* Below, Douglass airplane interior, for private passenger use, designed by Henry Dreyfuss.

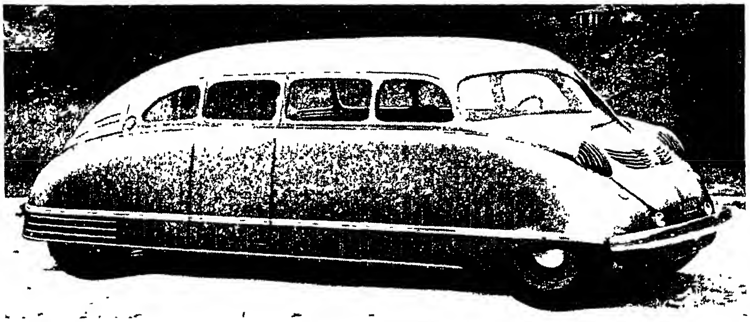
to some extent pooling their assets and writing a swift-moving new chapter in the history of mechanized travel equipment. Automobiles and trains are taking advantage of the streamline principle, as an aerodynamic fact in so far as its workability has been proved, and as an appearance determinant everywhere. The names of Kuhler, Loewy, Teague, and Dreyfuss are conspicuously connected with the movement, and some of the other prominent designers have contributed to it also through engineering design centers and technological laboratories.

Automobile design is visibly in process of revolution as the step-by-step modifications realized in industry's practice of new models every two years begin to approach basic redesign, such as scientific engineers and technological theorists have been visualizing for a decade, wherever they have been able to work sufficiently free of handicaps of precedent and fashion. Actual advances conspicuous in recent and forthcoming models are in the direction of substantially rounded front lines and tapering rear-end lines, less conspicuous radiators, absorption of fenders and running board and lights into the body of the car, and consolidation of body and frame units. Larger interior space with movable furniture, and sealed, air-conditioned, soundproofed interiors are other coming features, and there is general use of new materials, including shatterproof glass and plastic moldings, in conjunction with new methods of working the body metals, yielding increasing adaptability and beauty to the form. The whole revolution represents an approach to the ovoid form, with rear-engine construction a probable immediate innovation.

Glenn Curtiss, the American airplane designer, conducted experiments in automobile design reversed. Geddes took these as a point of departure, and with exhaustive experiments in such aerodynamic factors as undercar drag and quartering winds, produced his earliest teardrop model, subsequently embodying what he conceived as the maximum of acceptable







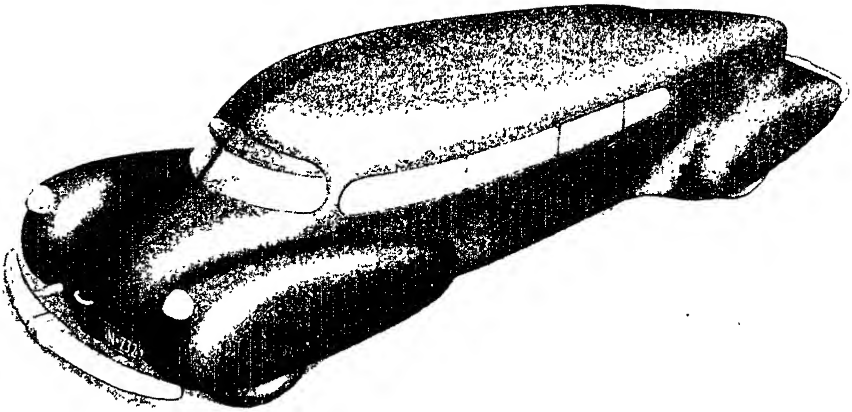
Progress toward the "teardrop" automobile. Above, Norman Bel Geddes' model of a future rear-engined car (1932). Center, Buckminster Fuller's "Dymaxion Car," a three-wheeled teardrop design, now being built to special order. Below, the Stout car, the first rear-engined design to appear on the general market.

"streamlining" into designs for production. These, considerably modified, have been built into the most advanced line of American front-engine cars marketed in the period from 1933 to date.

The rear-engine car was anticipated in Germany in the years immediately following the war, when an aeronautical engineer named Rumpler built and drove a model of all-metal, with body and frame a single unit, with the engine rear-mounted and with surface projections largely sheared off. Similar road models appeared in France, and originally conceived experiments toward the same end were painstakingly developed in Detroit, including those of Fishleigh, who juxtaposed his models based on airplane-construction practice with drawings of conventional automobile designs. He showed how these, in spite of their phenomenal styling, had failed to progress in any fundamental way; rather, had kept the body lines of an antiquated milk cart.

Raymond Loewy and Walter Teague have contributed step-by-step design in the automobile field during the years when most innovations appeared in the form of interior decoration and added gadgets. As early as 1928 and 1929 Loewy was patenting drawings representing automobile design improvement, some of which is becoming familiar in today's motorcars, and some of which still lies along the line of developing tendencies. As a result he was retained by a leading manufacturer for whom he designed one of the earliest streamlined cars, with tapering body and built-in headlights, and subsequent new models. Loewy works ahead, but not too far ahead of market demand, and with one eye always on it. He studies development trends, and charts them (as here illustrated), always predicating his actual work upon factors that are deducible from product evolution broadly understood.

Teague designed in 1930 a Marmon car which looked noticeably advanced when the season's best automobiles were still bolt upright, and

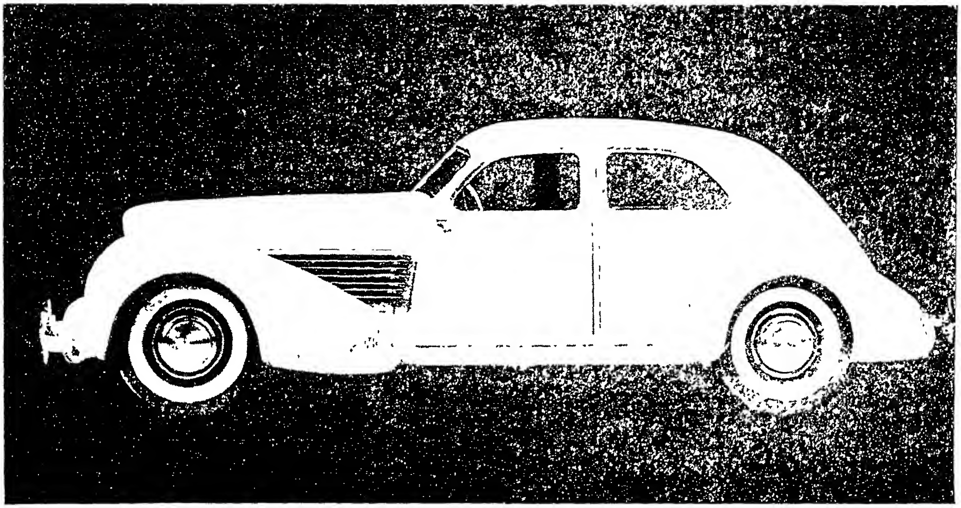


Visualization by Raymond Loewy of a future motor car.

which does not look out of place among this season's models. Examined and contrasted with his subsequent model which appeared in 1933, however, it illustrates the entire process by which subtle changes in outer form have tended to produce organic streamline style, in the direction of the smooth ovoid form. Engineering efficiency, current style trends, and a careful regard for line were the controlling factors. By actual test, air resistance was greatly reduced. An additional four inches in the length of the rear seat was accomplished in the process of redesign, to increase rider comfort and improve interior appearance.

Then, because the ultimate solution reached by the logically minded designer, to whom looking ten years ahead would be the height of folly, proved to be in line with that of technological theorists and experimental engineers, Teague proceeded to reverse his design. That is how he happened to produce on paper, in 1932, what looked like his own Marmon current design made to run backward.

Buckminster Fuller's three-wheeled car, which has been limitedly marketed and used for several years, is to be mentioned in passing as an influence in the direction of popular rear-engine design. The one practical rear-engine motorcar being actually marketed at a not unreasonable cost, and being actively promoted as a means of hastening general mass-production use of this design, is the Stout car. William B. Stout, its designer and producer, is a prominent figure in the history of American aviation and in aeronautical practice in both its governmental and its commercial departments. After having engineered and developed many pioneer aircraft models used in this country, including the first cantilever wing monoplane used by the army, the first all-metal torpedo plane used by the navy, and the first all-metal transport plane, he undertook revolutionary reforms in road and rail travel, conceiving aircraft engineering as the means to lighter weight and stronger and more beautiful equipment.



Cord car, 1936 model. Currently the most advanced front-engined design.

Because of the intention, because of the approach, which is typically that of the industrial designer, and because of the thoroughly organic solution achieved, this design undertaking may be profitably studied. The engineer initially decided that automobile design had always been wrongly approached by the manufacturer, and that new foundations must be laid for any judgment of what the ideal motorcar should be. Consequently he began in 1931 research which extended over a number of years and included thousands of studies in use aspects alone.

Under the head of safety, all such factors as driver visibility, brake efficiency, and ease of control were restudied. Steering stability in cross winds, an aerodynamic problem present in all land-vehicle design, was another. Under the head of comfort, soundproofing and air conditioning were considered, as were types of spring suspension, and the proportioning of seats best adapted to the human frame.

This was streamline designing *from the inside out.* Actual human measurements determined the placing of seats, control mechanisms, etc., and interior dimensions, including those of windows and doors, and the height of the ceiling. Safety and comfort resulted from placing the engine at the rear, as did economy of operation. Sound, heat, and odor are left behind. A new functional efficiency is provided representing safety measures taken, as was the streamline, directly from nature; as observable in all swift travelers on foot, the "eyes" are placed far forward, and a maximum of visibility thus ensured. Removal of the long, vision-obstructing hood achieves it in the Stout car. The front-to-rear shaft is gone, bringing the floor within 12 inches of the ground. In keeping with now accepted ideas, the running board has disappeared, and the additional interior width yielded is used in this case for a 65-inch davenport which replaces the rear seat and which can be unfolded and made to serve as a cot. Fenders have become part of the body, which is compact, simple, and functional, representing as much as is known

of scientific ground-vehicle streamlining. If there are formal and expressive design values still to be realized on the basis of the efficiency, economy, and comfort represented in the current model, the fact is less important than that this engineer has established the new direction, and demonstrated the new approach to automobile appearance design along the line which gave us today's airplane appearance.

The motorbus arrived at rear-engine mounting well in advance of private passenger cars. Those huge, swift vehicles roaring over superhighways carrying passengers, baggage, and mail from coast to coast challenge trains, and private automobiles, and planes. They have challenged also the industrial designer, to the end that at least a half-dozen members of the new profession have contributed to bus evolution.

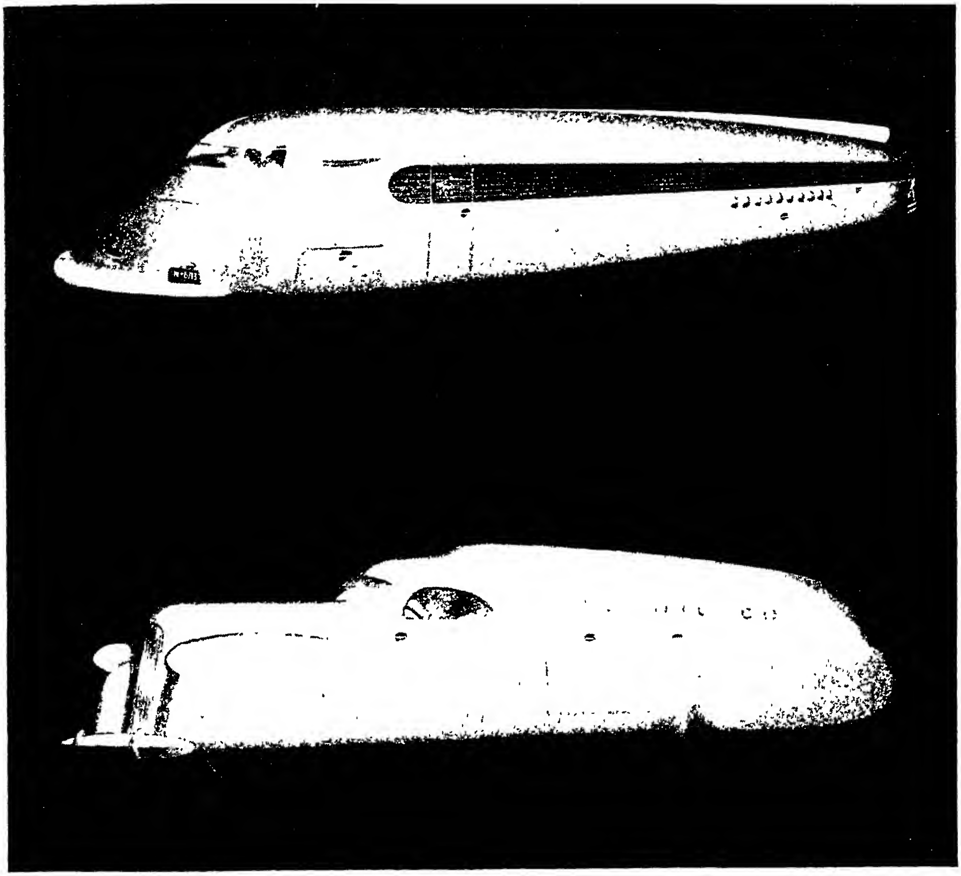
Because the form of the vehicle is nearer in proportionings to the streamline prototypes of airplane design, and because production conditions make experiment simpler in this field, considerable progress was made at a relatively early date. The old stagecoach design logic has all but disappeared. But here again, the artist has not yet had opportunity to do his best in work for practical production. Richard Neutra's drastically different all-metal "Pullman of the highways," commissioned as a mass-production model by a leading manufacturer, failed of realization. There are legal restrictions imposed by the Interstate Commerce Commission and by (often conflicting) state regulations governing vehicle dimensions and safety equipment, tending to limit evolution to slight and gradual changes from traditional form, while regional baggage-carrying requirements tend to discourage uniform design, or wide mass-production methods.

The Neutra model, with the widely publicized early Geddes design and some German visualizations, have been adjudged the most scientific advances in bus-design theory. During the development of the Stout automobile, however, an all-metal rear-engine bus was perfected in the same

laboratory. It has the same welded tubular frame, and incorporates many radical features for ensuring smooth-riding passenger comfort. As produced by the Gar Wood speed-boat builders, it promises to lessen materially the gap between existing theory and practice in bus design.

In the Raymond Loewy studio, where the broadest contemporary activities in design and redesign of road and rail travel equipment may be studied on the way to practical production, and side by side with the designer's visualizations of projects that are in advance of possible present production, an extensive bus design commission is current. It represents a long-range program including the redesign of current road models and later provision of new models for the Greyhound Bus Corporation. Analysis of one of these redesign projects affords a practical demonstration of what the industrial designer who is artist and engineer can do when he is not free to make a fundamental approach. His efforts come under the three heads of passenger comfort under the conditions of long-distance road travel, safety and increased driver efficiency, and better streamlining. Wheels, the instrument boards, and interior fittings have been restudied and made the bases of improvements. Engineering improvements have been introduced to modify the body forms and lessen their wind resistance, and artist effort has been responsible for complete redesign of the conspicuous advertising emblem. The redesigned models represent a higher standard of appearance and efficiency on the road. It is only when they are placed side by side with the Loewy bus-design visualizations, which are now perfectly practical and realizable from a basis of functional replanning, that the more striking demonstration is made of what still remains to be done.

This contract, the largest of its kind to be given, is for work on equipment already representing a good standard among competitors. It also serves as a convenient example of another development which is one of the most promising to be observed: the tendency of industrial-design effort along a



Visualization of a future automobile bus and design for a truck by Raymond Loewy.

single line to broaden into comprehensive commissions reaching out into numerous fields. This company's undertaking to industrial-design its rolling stock soon became that of industrial-designing all its properties and facilities. The quality of efficiency and machine-age style going into the busses was recognized as a valuable asset for terminals, their furnishings and equipment. Therefore Raymond Loewy was engaged for cooperation with architects of a dozen leading cities in the design of new buildings, where the design characteristics now familiar to coast-to-coast travelers are to be reintroduced throughout varying terminal building requirements.

Motor trucks, like busses, have always had their own special and exacting use requirements. The design of both has hitherto been conceived largely as an adaptation of private passenger vehicles. Today, however, the new design logic is being externalized until in this field we are becoming witnesses to intensely dramatized presentations of freighting function. Abstract speed and power are externalized and made concrete anew in cavalcades of streamlined trucks seen on all intercity highways. Raymond Loewy's designs for one great group of them, the International, are among the most satisfying to the eye. Those about to pass on to the road as a product of Geddes' studio go beyond any yet seen.

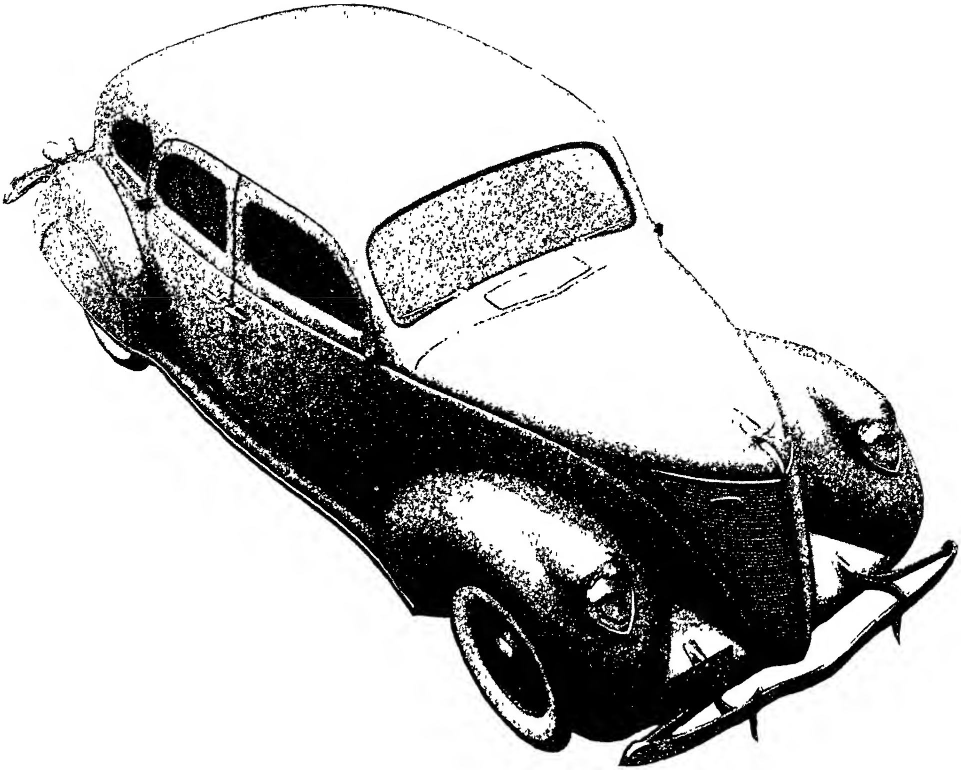
Despite incomplete understanding as yet of aerodynamic science in its application to ground vehicles, automobiles, motor busses, and motor trucks, these are the streamline superlatives of our familiar daily environment and our most constant reminders of the new design principle. The gallon of gasoline will carry us farther and faster than ever before because technology has been refined to the point where precise functioning and expressive form are dual products of the same process, of engineering plus art.

There were twenty-six million registered automobiles on the streets and roads of the United States in 1935. In the same year American factories (including Canadian subsidiaries) turned out more than 4,000,000 new cars.

That these all approached appearance standards warranting the appellation "works of art" no one would claim. Yet they all reflect revolutionary developments. The appearance of the new front-wheel drive Cord marks a high point, as did the introduction of the airflow Chrysler and the coming of the Model A Ford. To overlook their built-in appearance values would be to confess blindness to an aesthetic expression of the machine-age which is common to everyone's environment, to the everyday life of all classes, in cities and in the country.

But never has change been so in the air as today, when automobile use, and the use of automotive vehicles for all purposes, is increasing, when the industry is teeming with new activity and new experiment. Never has talk about style—accompanied by a slide toward streamlines—been so evident. Meantime "locked door" engineers and designers are working more feverishly than ever, outside the cycle of industrial practice where consumer acceptance is the law; and the teardrop form is being approximated more and more nearly in demonstration road models, threatening to precipitate presently a new mass-production phenomenon as consequential as that represented by the 1927 Ford. This will mean the end of autonomous color and style departments in automobile-manufacturing centers and the coming of integrated engineering and artist design services such as do not yet commonly exist in this field.

Proposals which would have sounded fantastic in the recent past are being listened to intently by industrialists. These include not only new designs but new types of vehicles, and a new economic approach to the entire problem. This is happening because voices too authoritative to be ignored are telling the public that new things are due. One of them is a $200 utility automobile, a product of new functional engineering, and—we may be sure—new appearance designing. Jonathan Norton Leonard, unofficial biographer of Ford, in his book *Tools for Tomorrow* gives a convenient

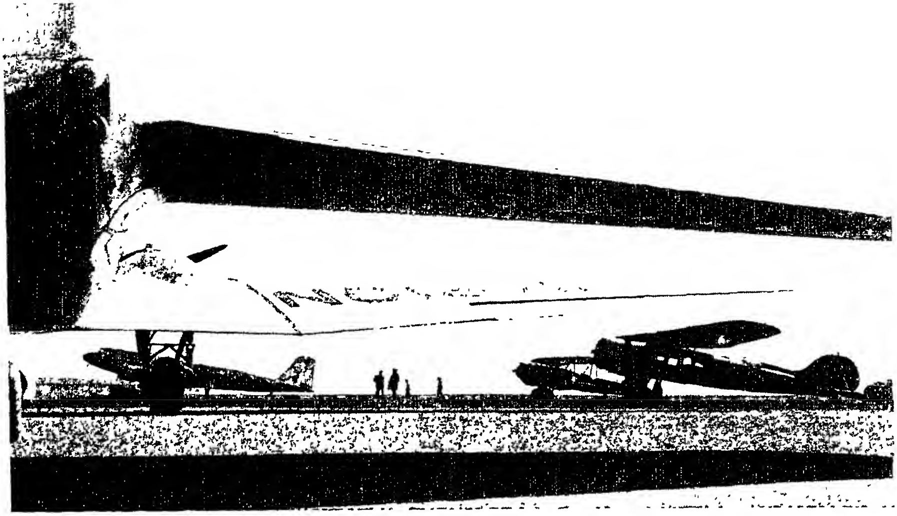


The Lincoln Zephyr, 1936 model. Indicating design trends in the more conventional front-engined cars.

account of how excess costs in current automobiles have paved the way for such a development: for a car without the luxury items which have been added consistently as an advertising appeal, in even the "Big Three" low-cost cars. Mr. Leonard is not alone in predicting that there is a large public ready to dispense with horsepower which is never used, gadgets added in a competitive effort to increase sales appeal, and extra cylinders and fancy upholstery. He also shows how industry is restrained from making these revolutionary moves until outside demands necessitate them. Another line of development, at the other extreme from the average car, is in anticipation of uninterrupted high-speed travel on new types of superhighways (such as may call for special drivers' licenses).

If in setting forth briefly the story of changing motorcar design and the progressive in-building of the streamline principles we have arbitrarily chosen instances entailing the services of named designers, it is not because we are unaware of the greater amount of routine and even inventive styling that has been accomplished at the hands of anonymous designers hidden in the color and design departments of large producing plants, working as they are under rigidly limited conditions. The great corporations, even when buying outside industrial-design services, avoid giving publicity to the designer, thus securing to the trade name of the car the advertising value of the appearance characteristics. The significant fact, however, is the changing public opinion bringing growing recognition to the industrialist that the appearance element is something more than dressing and show.

The largest unit in the industry, the General Motors Corporation, frankly discounted the color and design factor except as providing competitive "eye appeal" through the years when Chrysler, Graham-Paige, and other companies were pioneering in the direction of the new streamline standards. But General Motors has come over to the view that utility and good taste go together. President Alfred P. Sloan, Jr., of the Corporation in his annual

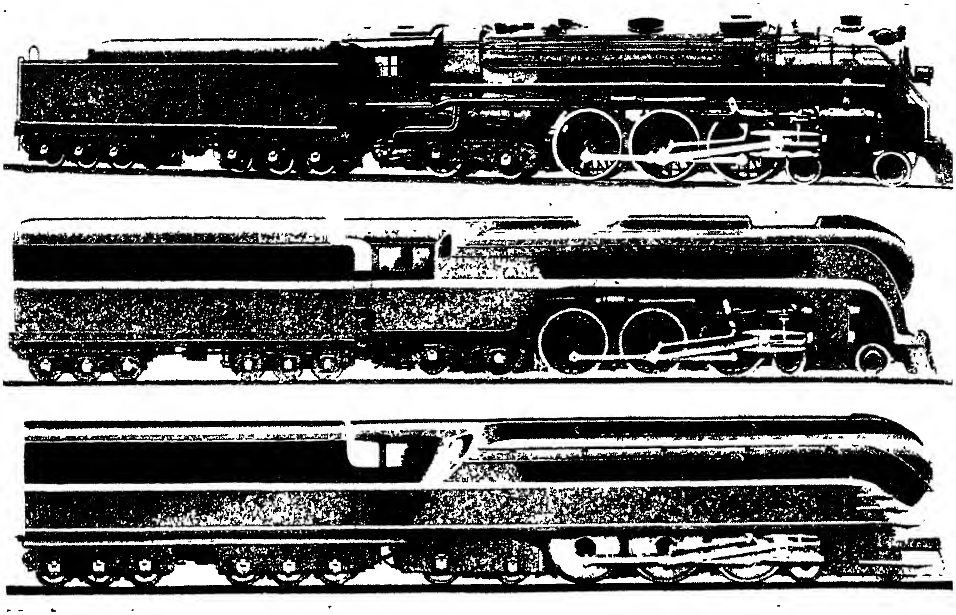


Two photographs by Margaret Bourke-White of T.W.A. mail planes.

report for 1935 spoke approvingly of "streamlining that is refined to beauty."

It is obvious, however, that there are further steps still to be taken toward shearing off protuberances, stream-flowing the body, and expressing inner mechanical logic and unity, before evolution is completed even along recognized lines of development. The earliest automobiles were carriages, with their countless mechanical complexes and accessories stuck on. The process of grouping and coordination has gone far. But even the current Pontiac or Nash or Hudson indicates its design ancestry in the premachine carriage, rather than representing rational from-the-ground-up motorcar design.

Meanwhile, even the plodding half brothers of the automobile strive for the style marks and streamline idioms of the elegant road traveler. Street-cleaning equipment and snow-removal machinery, derricks and dirt scoops, with all the other power mechanisms, nameless to the lay person, which are busy where foundations are being prepared for new skyscrapers, participate. Even concrete mixers take the automobile as inspiration for their appearance. Awkward elevated mechanisms have been designed down and encased in so far as efficiency permits. Lonely gadgets and humps and unsightly pipes have been brought within the unified scheme, and the typical bright metal casements are kept simple in proportioning and flashingly clean in appearance. Thus, the style mark borrowed from the free-flying plane is brought down to the humblest earth-bound mechanism, and we see that its legitimate application is almost limitless—if we understand it as a sign and a symbol of efficient precision appropriate to the nature of the product designed.



Three stages in steam-locomotive evolution, as visualized by Otto Kuhler, with increasing emphasis on the streamline idiom. (1929.)

7. TRAINS, SHIPS, STREAMLINES

THE steam locomotive was the nineteenth century's emblem of the age of mechanics. The old model is still compelling in many advertising illustrations, where we see it shrouded in streamers of smoke and eddies of road dust. But not in contrast with new models. The railroads, faced with new competition, are borrowing as much as possible of the airplane's character, and are building into their equipment (instead of faking on as in the illustrations) lines of power and speed. Drastic reshaping of official railroad policies in relation to design, and drastic remodeling programs are in progress.

There is a well-developed movement under way to "streamline the railroads." It is a national movement, but is part of world-wide activities to the same end. It has gone sufficiently far for official railroad organizations to foresee necessities for correspondingly far-reaching roadway redesign, to take advantage of gains in speed without endangering public safety. In the face of opposition in some railway circles and criticism from competitive transportation interests both on and off rails, new streamlined trains appear regularly.

Is it merely a phase of the styling vogue which in the twenties caused a few trains to appear with color schemes as striking as the plumage of an elderly peacock, to catch the public fancy if possible and to regain business lost to busses, planes, and private automobiles? Surely trains are not to be so lightly dealt with. An average train on the tracks is valued at well over a quarter-million dollars. An engine alone costs a hundred thousand, unless it is a diesel (which costs a quarter of a million more). It is not the crudely engineered product its past appearance may sometimes have indicated, but rather an intricate mechanism of many thousand parts, some of them of precision delicacy. A capital investment of twenty-six billion dollars is represented in American railroads. What could the new science of aero-

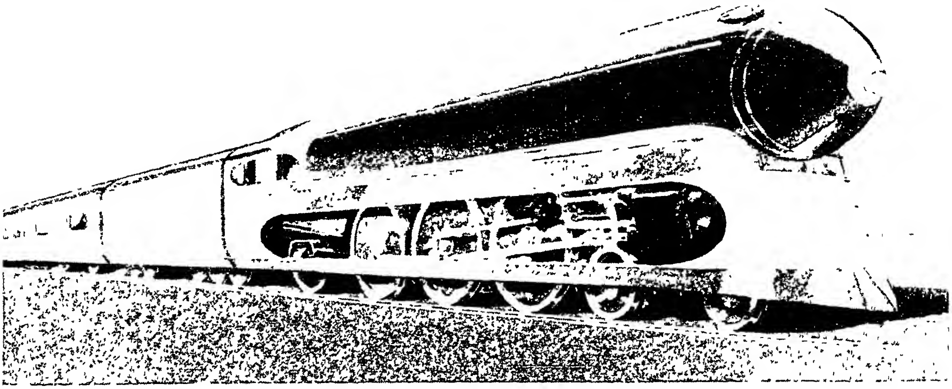
dynamics be expected to contribute that would be acceptable alike to public and stockholders? What above all was the artist figure we are talking about called upon to do? Would a man taking Picasso and the abstractionists as his precursors lay hands on those delicate and intricate vital parts?

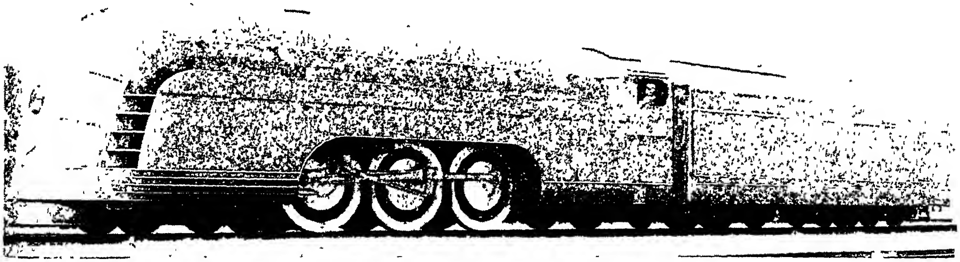
The railroad redesign policies and programs are predominantly industrial-design undertakings. Today's activities in streamlining American trains and engines have developed to a large extent from visualizations and according to designs contributed by the group recognized as leaders in the new profession. Where in the automobile profession the independent figure has been able to work only by a series of compromises, the industrial designer of railway equipment has been free to make revolutionary demonstrations, within the limits imposed by the functional engineering requirements and his own daring and ability.

Among the results is this: the public calls the new trains by name, it is familiar with their color and form characteristics, and it has ideas about the relative merits of the round-end observation cars as contrasted with those that taper. It has its favorites among the new taprooms and tavern cars, and the cafeteria services provided on different lines. The interior architecture and furnishings, too, are matters of public approval and are exerting an influence on bus and steamship interior planning for future construction.

Otto Kuhler, Raymond Loewy, and Henry Dreyfuss are among industrial designers by reference to whose work the major advances may be described and illustrated, with at least a mention of work by Dohner and Guild and Teague at different stages of the movement.

The Portlander, the Union Pacific's first light, diesel-engined train, in 1934, led the American streamlined procession, to be followed in rapid succession by new named, industrial-designed trains on many roads. Some of these appeared almost simultaneously, products of different designers, and of inspiration from outside the main style and design practice. Norman Bel





Streamlining of the steam locomotive. Above, a drawing by Otto Kuhler, for an uncompleted project; below, locomotive of *The Mercury*, a train designed by Henry Dreyfuss for the New York Central.

Geddes must be mentioned again as having developed, by 1928, the model for a streamlined engine and train as one of the embodiments of the aerodynamic principle under new sets of conditions. It was widely publicized and has been credited with having influenced the design of one of the earliest streamlined trains built. The influence was in the air from several directions. That year Otto Kuhler came to America, with drawings which included one of logical engine evolution (reproduced here). He was employed on the basis of these and spent the years 1929–1935 in cooperation with the designing engineers of railroads, preparing hundreds of studies and drawings, and participating in hundreds of conferences before any production work was undertaken. During those years, the Pullman Company, the Westinghouse Electric and Manufacturing Company, and the Goodyear Zeppelin Company were among prominent contributors to streamlined train evolution, as were the American Car and Foundry Company, the American Locomotive Company, and the Pennsylvania Railroad.

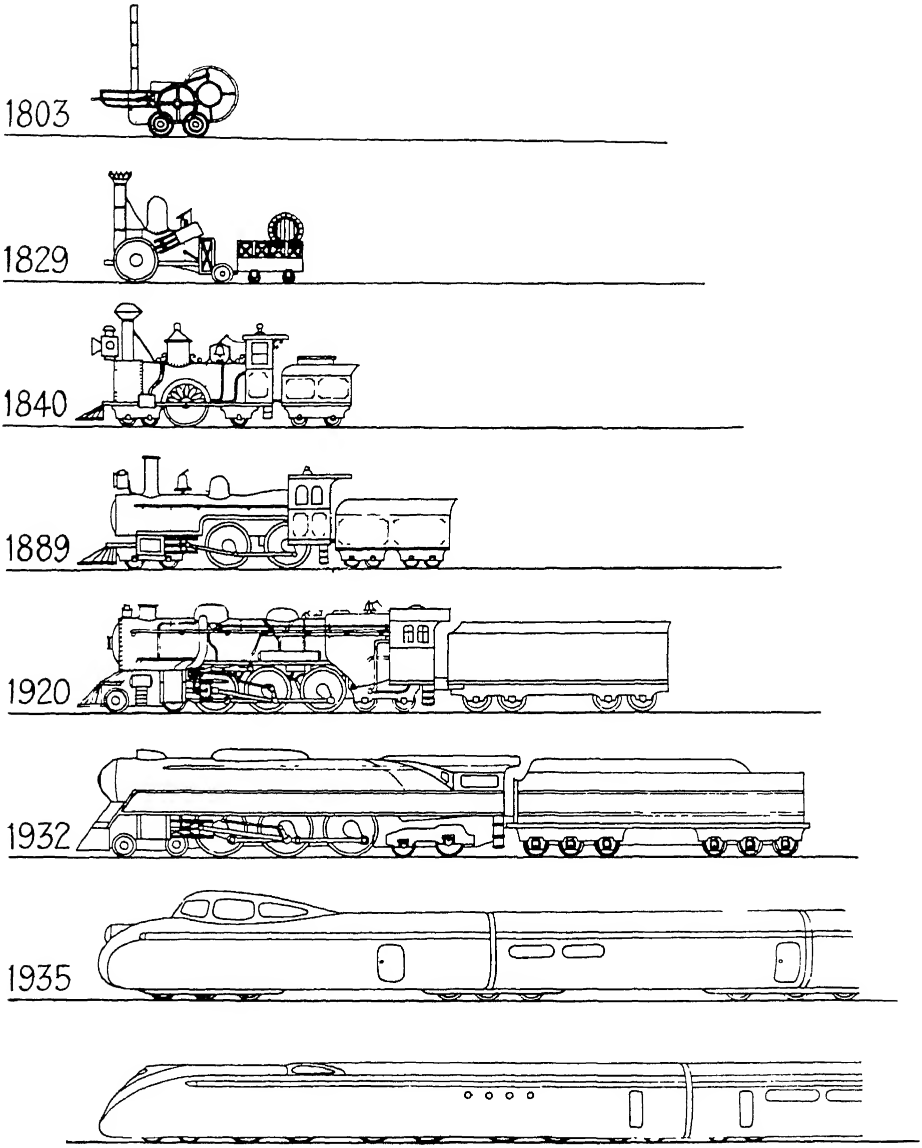
The movement which remarkably manifested itself in so many places simultaneously was everywhere accepted by its sponsors as the means to dramatizing for the public the tremendous progress in technical design of the past twenty years, and the bringing of equipment to a travel standard approximating that of the automobile and the airplane. This was conceived generally as an activity going far beyond the painting on of "streamlines" and the application of surface improvements. If in some instances there is a new misconception which has resulted in undiscriminatingly masked engine parts and emasculated locomotive character, with new forms reduced to the appearance of breadbox or refrigerator, it is outside the main activity.

In actual practice, the industrial designer has met the designing engineer on his own ground, and has worked collaboratively with him to enhance the functional advances in engine and train design (exterior and interior) into a new kind of expressiveness. Otto Kuhler phrases it admirably:

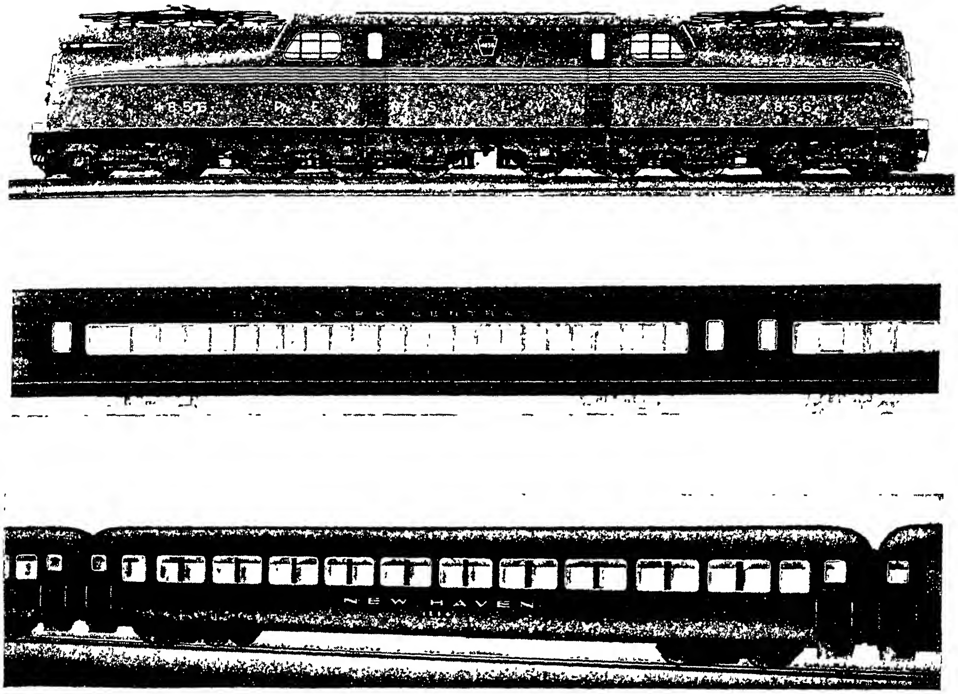
"We are there to help the locomotive express its personality. There is a new epic of the rails as fascinating as that of the nineteenth century: we have been asked to build the gains made over nineteenth-century railroad facts into twentieth-century equipment. The inherent beauty of the train as we now know it is capable of an emphasis that thrills the public."

Specialist engineers and train designers, Kuhler adds, are quite capable of arriving unaided at sound technical solutions along recognized lines. In fact they have been arriving at them progressively throughout the present century. They have been building longer and longer engines as they were forced by demands for more and more power, and always for longer trains; and thus, technical evolution eventually opened the way for industrial design. The engineer who carries forward the mechanical design progress is not, however, commonly competent to achieve an acceptable aesthetic standard, because his methods are those of science and not of creative art. Recognition has variously been given the fact that step-by-step technical evolution could never have produced today's representative streamliner of the rails, to give it its appearance values or its refinements in the matter of passenger service and comfort.

The industrial designer's intention is to make the trains look engagingly fast, efficient, and competent, which they already are, while incorporating into them such improvements as creative engineering vision can achieve toward getting the traveler where he is going with a maximum of comfort and travel enjoyment. This intention is being realized to the extent that the entire public is conscious of it, and the entire railroad industry affected. (There are streamlined trains, of which the New Haven's short, swift shuttle train between Boston and Providence is an example, which are admirable examples of a new functional engineering approach brought to this field by aeronautical engineers. They are outside this discussion because no professional thought was given to appearance design. There are other streamlined trains, some of



Evolution chart of locomotives, by Raymond Loewy. (See parallel chart of the railroad coach, page 25.)

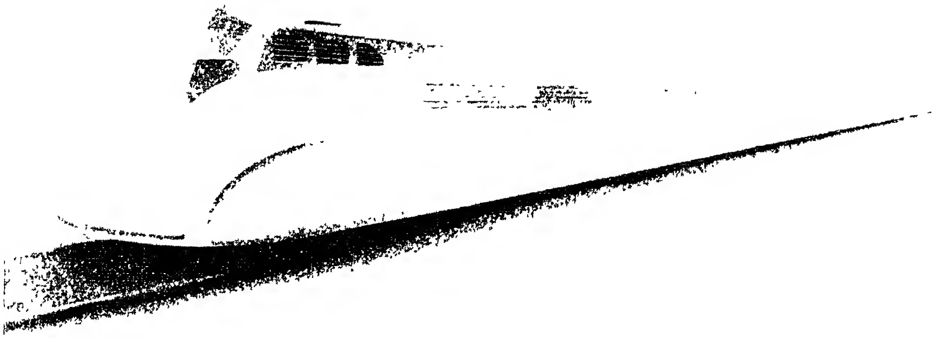


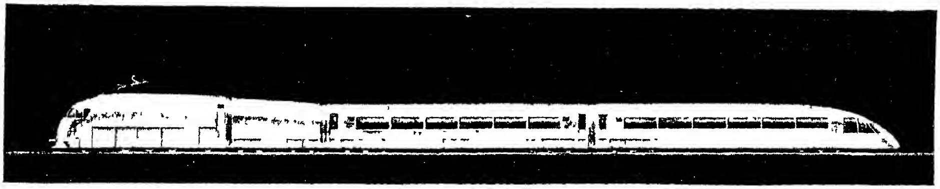
Three examples of artist contribution to railway equipment design within immediate engineering limitations and machine-shop practice. Top, Pennsylvania Railroad electric locomotive designed with aid of Raymond Loewy; center, cars of the New York Central's *Mercury* train as redesigned by Henry Dreyfuss; bottom, Walter Dorwin Teague's design for the one hundred day coaches recently put into service on the New Haven road.

the earliest, for which no industrial designer was employed, but in the development of which advantage was taken of all available data on developing streamline theory and practice.)

What Otto Kuhler has done in industrial design for the Baltimore and Ohio trains, the *Royal Blue* and the *Abraham Lincoln,* the Chicago, Milwaukee, St. Paul and Pacific train, the *Hiawatha,* all steam-engined, and the Gulf and Mobile diesel-engined *Rebel;* what Raymond Loewy has contributed to the design of the Pennsylvania Railroad's engines, steam, diesel, and electric powered, and to the New York-Washington train, the *Congressional Limited;* and Henry Dreyfuss' designs for the New York Central, led off by the *Mercury:* these are the most outstanding contributions made directly by members of the profession, and they are representative of the movement as a whole.

Exterior design is their most conspicuous fact. These engines and trains still attract crowds along the tracks, though some of them were among the earliest redesigned railroad equipment to be seen. And in some cases, where records are available, the new appearance values are shown to be responsible for materially increased revenue. Design character varies as is appropriate for the expression of various railroading traditions and regional circumstances. The Baltimore and Ohio officials embarked upon their redesign project well in advance of any streamlined train appearance in this country. This railroad had played a significant part in the early history of American steam-train operation, and it was therefore considered appropriate that the new appearance should stand for traditional dignity and power. The engines and trains were therefore oversized and superpowered, and the traditional royal blue was used on the historic route. Engine parts are left unmasked, and their machine character emphasized. Even the cow catcher is retained, though in a lighter and more flexible version than that of 1835. Sentimental reasons initially inspired retention of this feature, though the designer has shown by





Railroad trains at various stages of evolution. Top, a visualization of a train of the future by Raymond Loewy; center, *The Comet,* a New Haven railroad shuttle train, as designed by aeronautical engineers; bottom, design by Norman Bel Geddes, 1928.

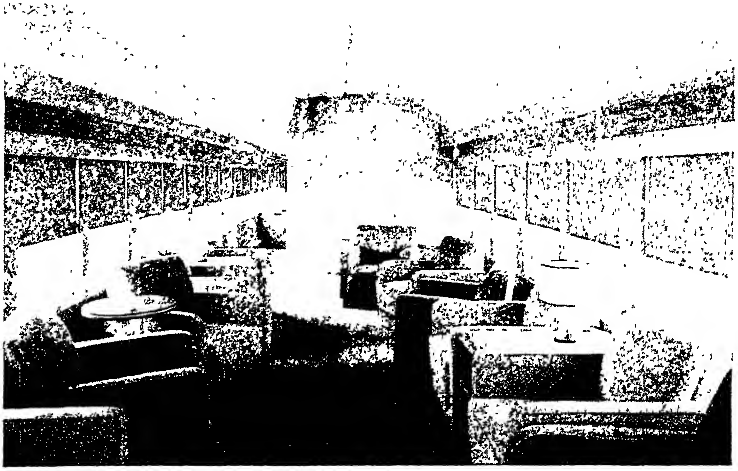
experiment that it has an important function in safety promotion in hurling possible victims (not cows but motorcars) free of the rails.

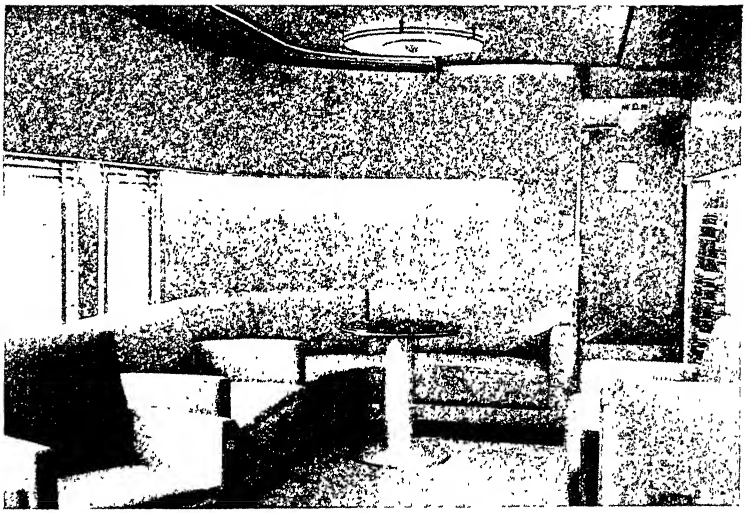
The *Hiawatha* engine, and in a different manner the *Rebel* train by the same designer, represent a diametrically opposed approach. Revolutionary appearance values were conceived as appropriate to regions where railroads have no long traditions. A front view of the former, therefore, offers a striking contrast to the *Royal Blue,* for instance. Its sleek, smooth-faired airfoil superstructure, extended downward to foremask the wheels, suggests nothing so much as a silver, orange, and maroon tropical fish.

The Loewy model K-4-S steam engine for the Pennsylvania is built on a modified projectile form. (American grade-crossing regulations and construction practice are such as to prevent full advantage being taken of the most scientific cartridge form.) The flow lines are extended to include the tender and are repeated in the smoke-deflecting fin, which was developed after extensive experiments which had the object of keeping blown smoke from interfering with vision—thereby promoting safety.

In the early stages of locomotive restudy, Dreyfuss made plans for engine cabs where fat men could sit with greater comfort than had ever been possible, and for the regrouping of engine units to permit oversized engineers to reach parts needing frequent oiling. Not until 1936, however, did this artist have opportunity to see a complete train of his design on the tracks. In the New York Central's *Mercury* engine he has done a stage artist's job of speed-and-power dramatization, as already noted. In the train he was given greater freedom than has been accorded any earlier designer, and he has treated the whole as one design problem.

On the whole the roads have advanced more in appearance design of locomotives than of complete trains, and more in exterior than interior effect. There seems to have been steadier and more revolutionary progress in locomotives, and a greater tendency to base what is done upon structural





Interior views of parlor car and lounge car on the *Mercury* train of the New York Central redesigned by Henry Dreyfuss.

improvements of fundamental nature. Coaches have changed since the not very distant period when plush, and steel panels grained in imitation of wood, prevailed. The doughty passenger who said not so long ago that the only improvement in railway coaches for twenty years was the slot in Pullman washrooms for disposal of used razor blades is making less and less complaint. There is occasional new train-interior design patterned after ideas found in the field of motorcar design; and interior ensembles equaling the standard of the modern home are already the ideal on a few pioneering railroads. Otto Kuhler worked toward this ideal in the *Rebel* coaches, particularly in the observation car. Walter Dorwin Teague has made the most comprehensive contribution to it in the type coach for mass production now used by the New Haven railroad; while the most advanced design in this field is that of the *Mercury* coaches.

Teague collaborated for a year with car builders and railroad before the first of the one hundred passenger coaches now in use on the New Haven was produced. The results are strikingly apparent in the gay, lively color scheme of blues, gray, and white, and touches of vermilion with liberally used polished metal. The windows have been redesigned and grouped in pairs. The chairs are designed on automobile-seat principles, and like seats in some exceptional motorcar models, may be shifted into position for talking or cardplaying. The use of new body metals here, as in all the most progressive train-design effort, has resulted in weight reduction, and in a substantial gain in interior coach width, a gain which has been effectively capitalized as an appearance value. The Teague coach weight has been reduced by 40,000 pounds, the weight of the chairs per coach becoming meantime two tons less.

Similarly in the Dreyfuss cars of all types, for the one train now in operation, the *Mercury,* the designer carried out a complete, integrated scheme. Exterior and interior color schemes, seat arrangements (particularly radical in observation and dining cars), and all fittings down to hardware,

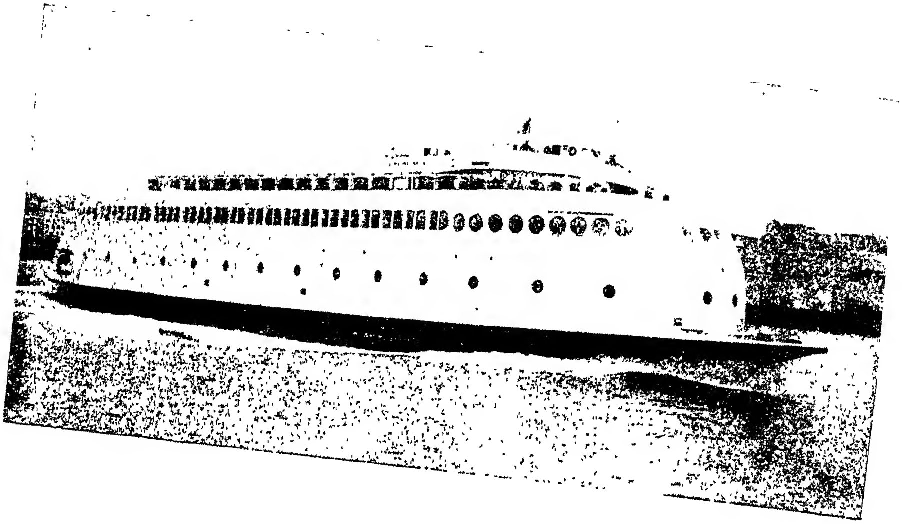
lighting elements, and furnishings of glass and metalware fixtures, were included in his work.

Apart from the advertising values of the streamlined trains, generally recognized gains include a smooth gliding motion; increased speed with safety; and fuel saving, realized by reduction of wind resistance, and increased in direct proportion as speed increases. The streamlining of engine and tender, and the redesign of vestibules and couplings are now generally familiar means to a single-unit-train effect, while individual solutions of new problems are rapidly contributing to an established industrial-design practice in this field. Otto Kuhler's expedient for increasing engineer visibility, and correspondingly passenger safety at crossings, is illustrated in the *Rebel* engine, which is diesel-powered. Loewy's solution of vision clearance ahead —the smoke deflector, tested out by experiment in the same wind tunnel where he made studies of the aerodynamic efficiency of the projectile form—has had the incidental effect of permitting the engineer to make his customary runs without goggles and without the customary grime.

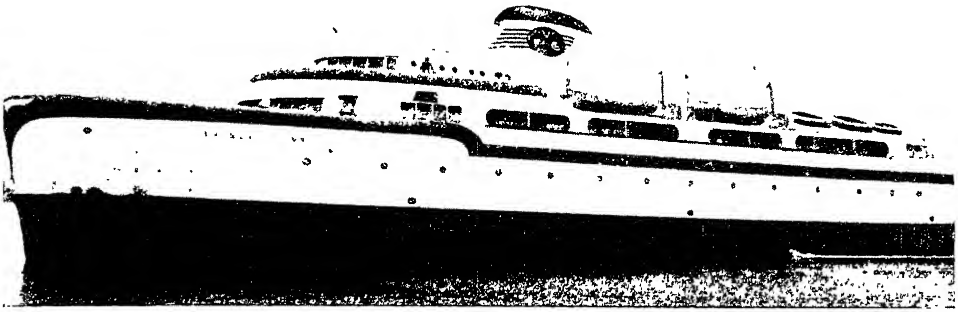
Air conditioning, sound and jolt deadening, and scientific lighting are accepted features of train interiors, and are among the bases of the new interior planning, where restudy of color and line, and certain drastic new conceptions of train furniture, give promise of appearance standards going far beyond any yet realized.

Progress made in designs for automobiles and trains to improve their appearance is just at its beginning, perhaps; but an even less effective approach has been made to the industrial-design problem of the ocean liner. In the field of smaller public-service watercraft, there are but two streamlined ferryboats, one in operation on the Pacific Coast, the other on the Atlantic.

The *Kala-Kala,* a 2,000-passenger ferry operated by the Puget Sound Navigation Company between Seattle and Bremerton, Wash., is thought by its designers to be the first unit-constructed all-steel, unsinkable



The *Kala-Kala*, first streamlined ferry boat, in operation between Seattle and Bremerton, on Puget Sound.



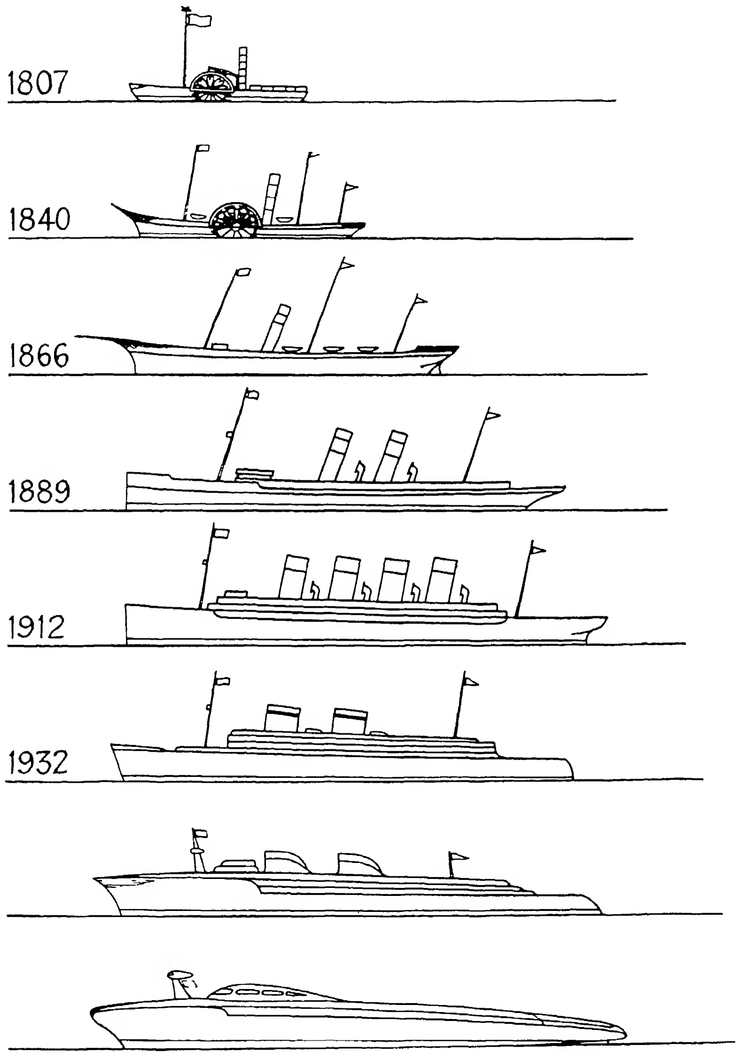
The *Princess Anne,* a Chesapeake Bay commuters' steamer, appearance designed by Raymond Loewy, the nearest approach to streamlining to appear on ships on the Atlantic seaboard.

craft of its kind to be built anywhere. The five-deck exterior is airplane sleek and smooth. The interior is equally modern and includes unique passenger provisions for short-trip vessels. There is a 50- by 80-foot observation room of glass, with a woman's lounge, and with special rooms equipped with showers and lockers for the benefit of men commuters. In the great cabin, with its seating capacity of 700, and in all the smaller passenger cabins and feature rooms, special color schemes have been introduced. But it is the exteriorization of the modern features in the boat's appearance that has made history in the shipbuilding field.

Within a year after the *Kala-Kala's* first run, Raymond Loewy's 2,000-passenger "commuter," the *Princess Anne,* was put into service between Cape Charles, Md., and Norfolk, Va. This boat, with a hull of aerial-travel lightness, is full streamlined, and is a variant example of the industrial designer's way of expressing functional truth with personal interpretation of modern idioms.

Otto Kuhler's designs for a small ocean liner, worked out in collaboration with naval architects, is one of the many visualizations of modern steamships radically unlike the present "floating hotels." This is the field in which the first and greatest progress might have been looked for following the precedent established by airplane design. From Geddes' great porpoise-form trans-Atlantic passenger ship to Kuhler's charts and drawings, theoretical progress in design is as far ahead of practice as the light two-mile-a-minute streamlined train is ahead of the old balloon-stack engines.

In train and ship design, as in practically every other field, men making designs that pass into manufacture and use are usually working creatively and much more fundamentally on problems of the distant future. Raymond Loewy, on the basis of work done on his Chesapeake Bay ferryboat, went on to investigate the practical present mechanism of a small liner, and as a result sees an already feasible 2½-day schedule between New York and



Evolution chart of power ships, by Raymond Loewy. (To be compared with charts of land vehicles, pages 25, 99, and 126.)

Europe. Otto Kuhler, meantime, turns back from his steamship experiments to the problems of the future locomotive, and is making studies in the possibilities of wireless power in train operation.

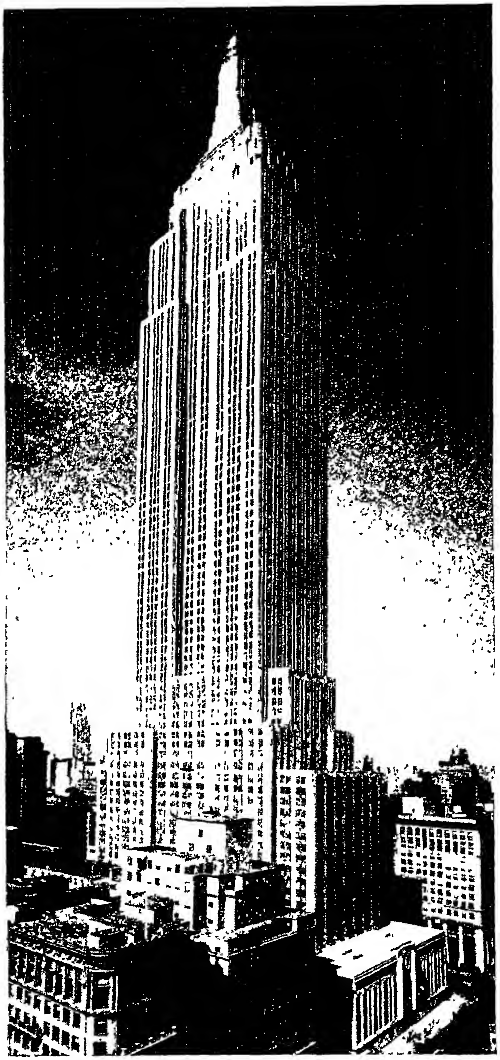
We thrill, then, to the present spectacle of dramatized motion in transport vehicles, and to the conviction that we are on the threshold of changes beyond prediction. An epic visual transformation of all that travels by highway, water, or rail is beginning to materialize before us.

The new term "parasite drag," used for forces that impede smooth air-flow progress in speeding bodies, provides a useful metaphor just here. There is a psychological drag. It is familiar as *appearance precedent.* Industry knows it and shapes manufacturing policies accordingly. It is most observable where manufacturing is most expensive and heavily capitalized, and where the production and consumption cycles are correspondingly slower, as in trains and ships. It is responsible for giving the revolutionary new product—too often—the appearance of the one being replaced. The Pullman and the Parthenon alike afford examples. Both bear the marks of outmoded materials and techniques. In the one case, there is imitation wood graining on steel panels. In the other, there are Doric columns of marble tapering upward to conform to the remembered appearance of earlier temples where the columns were still of wood in the natural form of the tree trunks that provided them.

On the first trip out of Albany by railroad, in the forties, the train had merely a coach such as was then considered suitable for ladies and gentlemen going traveling. The engineer sat like a coachman on the platform above his iron steed, wood and water at his side. The conductor rode outside on a narrow ledge as if he were a footman. Early, the Fulton steamboat builders threw up a superstructure with compartments to provide privacy for personages accustomed to travel in state, governors, senators, and the like; the compartments accordingly became "staterooms," a name which we have with us as a vestigial remnant today.

Even the motorcar, free of almost all tradition, met similar treatment. No longer ago than the nineties, George Whitney built his first automobile, basing it on experiments with a small steam engine mounted between two bicycles—and immediately came into collision with the laws of the Commonwealth of Massachusetts. When he tried to give a public demonstration on the streets of Boston, the police stopped him. Vehicles propelled by steam, they said, were forbidden to travel on streets and highways at a speed greater than three miles per hour, and were required to be preceded by a man carrying a red flag. (The passage cited was from a section governing the use of steam rollers.) It was only when two senators, named, as it happens, Coolidge and Lodge, became convinced of the purpose and the practicability of the Whitney contrivance that steps were taken to have its use legalized. Thus started one of the lines of development that flowed together to produce the White Steamer, and thence today's automobile.

We begin to arrive at last where we can regard with some amusement the almost universal inability to dissociate a new thing from the use tradition which produced or preceded it. We are achieving a new analytical objectivity which enables us to detect the surviving remains of the old family carriage in some of the most advanced superpowered motorcars (even those which have been subjected to the most meticulous style and color department services). It is because the airplane has been given almost ancestorless to our generation—and with it the streamline as sign and symbol of the new freedom in space—that we begin to emerge beyond the confused view. The latest swift travel creations, the automobiles and trains, as fast as they can be brought to fulfill, with due expediency, the new artist-engineer's perceptions, do their share to crystallize the appearance of the new world.



The Empire State Building, New York City, New York. The industrial-design approach clearly signalized, with machine-age idioms emphasized, but with little originality or formal-design expressiveness. Shreve, Lamb and Harmon, architects.

8. THE NEW ARCHITECTURE AS INDUSTRIAL DESIGN

THE Empire State Building, currently "the highest man-made structure," is somewhat less than perfectly expressive of the machine age; yet it could have been built in no other time than the machine age. Its uses do not include certain of those fondly hoped for by the architects and owners. Its pinnacle serves no Zeppelins as mooring mast. There are scores of unoccupied floors, evidence of miscalculation as to economic function. Nor is the building first-rate when considered objectively as Modern visual design. Nevertheless it serves admirably as a symbol.

To vantage points for miles around, it advertises that there is a new architecture. As one sees it beyond the Metropolitan Life tower (Venetian) or the New York Life tower (Gothic) or the Paramount Building (Hollywood Eclectic), it is like a standard raised to the sky asserting that between the time of erection of those other monuments, traditionally styled, and the building of the Empire State, something like a revolution had occurred. The squared forms, the naked unbroken lines, the preponderance of gleaming metal and glass, proclaim independence of traditional artistic influences, and reliance upon visual idioms of the mechanized era. Thus the world's highest building is something less than eminent as architecture, and yet holds up unmistakably the sign: "There is a new way of building."

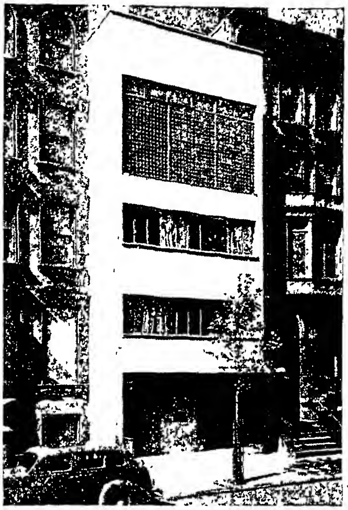
The building advertises not only new methods and new materials, both born of the machine processes, but also, in its negative aspects—by those unoccupied acres and acres of offices—the necessity of a new approach to architecture: as a complex of social and economic problems, as itself a mechanism to be fitted functionally among other machines.

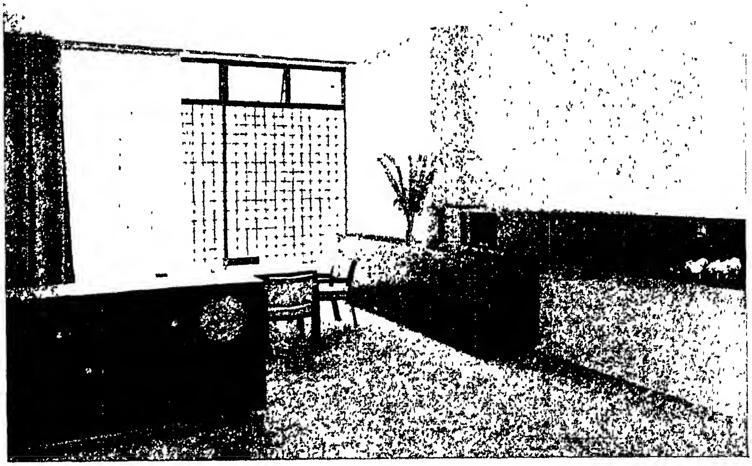
It is not by chance that the new architecture and the new industrial

design emerged into expression and wide public recognition in exactly the same decade, between 1925 and 1935. They are parallel manifestations. Or better it might be said that the new architecture is part and parcel of the new industrial design, and bears the same style marks because there is the same recognition, on the part of the artists concerned, of the functional truth to be expressed. A machine consciousness guides the artist's hand. The building (like the motorcar or the electric refrigerator) is regarded as an organism mechanically determined, scientifically precise, artistic only after use specifications have been satisfied, and incidental to their satisfaction.

If the machine itself during its first hundred years was incongruously ornamented with borrowed traceries and floriation, if the commodities manufactured by the machine were similarly "improved" with every conceivable sort of decoration from handicraft models, the architectural composition of the same years was no less adorned with traditional sterotyped additions. But the task of the first Moderns in architecture has been something more than a stripping back, an escape from the garments borrowed by the nineteenth-century Eclectics. It has made the revolutionary demand: the designer shall give up the idea of architecture *as walls.*

From the beginning of man's need for shelter, the problem of building has been one of walls, walls strong enough to carry a roof. As structures grew more complex, and higher, supporting additional floors, the walls of necessity grew thicker, more elemental to the art. And almost throughout the history of civilization, artistic architecture has been considered a matter of how the walls were to be ornamented. In the nineteenth century there was a climax of wall consciousness; and architectural practice became a sort of shuffling of façades, Gothic, Classic, Renaissance, or Old English, to ascertain which could best be stitched to the front and sides of the changing structure. As architectural engineering was at this time undergoing radical changes, so that a new type of skeletal construction was developing, there





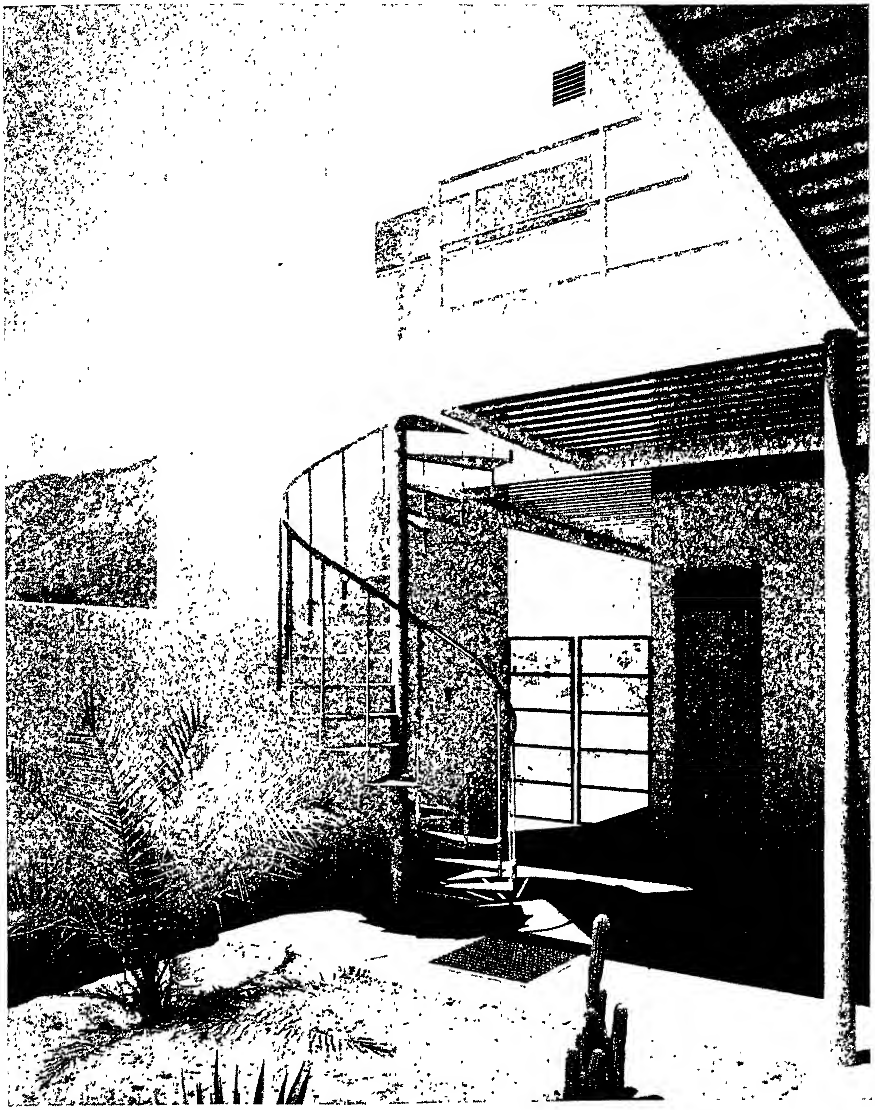
The Kramer house, New York City, by William Lescaze. New materials and machine-age simplification dramatically evident in contrast with Victorian ornamentalism.

came that strange paradox of the early machine age: building technology providing an organism of a new sort, animated by working machinery; and architectural artists dropping over the organism an unrelated garment. Most important, the need for walls as support for the upper floors and for the roof had disappeared.

When it was discovered that a very few and comparatively slight stilts could be made to carry upper weight, that the masonry was only an ornamental leftover as far as structural function goes—though the ornament generally pretended elaborately to be holding things up, by columns and arches—it dawned upon a few people that in future architecture would be not primarily a problem of wall construction but of space organized for use. New metal materials took care of weight, the building's sides might be considered merely as screens to be set in, of any light material, as needed. Architecture suddenly became incomparably elastic, free, opened to light, and beautifully spacious.

And so, if the layman finds the new architecture very different from the things he has been taught to revere as the masterpieces and normal manifestations of the art, there is more than the arbitrariness of a handful of radical designers to account for the change. There is expression not only of a different era, a change in man's way of living, but of a new way of making buildings stand up: of the most revolutionary change in structural principle since the earliest building monuments, the pyramids and the pagan temples, were erected. In our open steel-skeleton, glass-screened structures there is culmination of an ages-long struggle for light and free space. Today the metal support and new types of glass make possible an end of the dark tyranny of masonry, the achievement of space arrangements perfectly conditioned for good living.

Thus the term "the new space architecture" has a meaning beyond the mere matter of interior spaciousness accomplished. That aspect is significant,



Abstract values affording pleasure to the eye in "Garden Court," an apartment house at Palm Springs, California, designed by A. Lawrence Kocher and Albert Frey. Standardized mass-production materials and elements stressed throughout. The architects hold to the purely functional or industrial approach as sufficient guarantee of machine-age style.

too, particularly in relation to an increased openness of living (manifested in everything from freedom of belief to near-nudism). There is implicit a sense of escape from cubby-hole houses, from the idea of "every man's home his castle." But more fundamental, a whole side wall of masonry with its restricted set of windows may be omitted, and a screen of clear or translucent glass put in its place, to be shaded or curtained to any desired degree. In homes, terraces are extended, roofs become sun porches, indoors meets outdoors and mingles with it at many points.

When a change so revolutionary is being made, it is inevitable that the great majority of architects should respond to the drag of custom, and carry over wall-thinking into compromise solutions of the problems posed by the new living requirements, changed structural methods, and newly invented materials. There is every shade of "advanced" practice from timidly divergent progressivism to a ruthless machine-age rational design practice.

In a brief chapter like this a very few examples—and all of them of a sort that would have been termed yesterday "very radical"—will serve to illustrate the nature of the new architecture, as indissolubly a part of Modern industrial design.

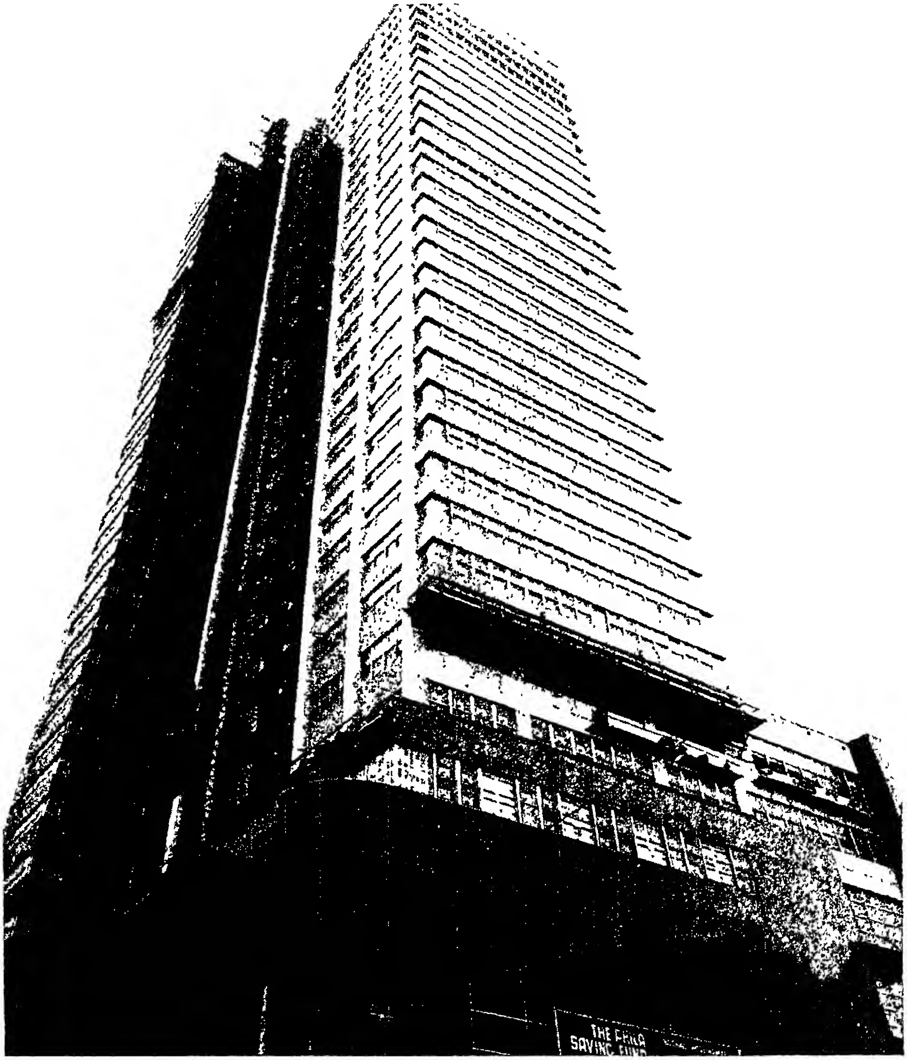
The skyscraper is, of course, the celebrated spectacular example, commonly supposed to symbolize industrial-commercial America and the triumph of mechanics. Instead, it is usually a compromise. As an expression of the machine it is apt to be carefully masked. Except for a half-dozen buildings that creatively and compellingly express the power age, and perhaps twice as many more that bring the mechanical consciousness measurably into the "looks," there is a record of a new spirit obscured, a new organism outwardly falsified.

Not that the average skyscraper of 1925–1935 fails to symbolize a certain drive and life of American life—often very thrillingly. The thrust, the indomitable commercial push, the will to conquer, carried these towers into

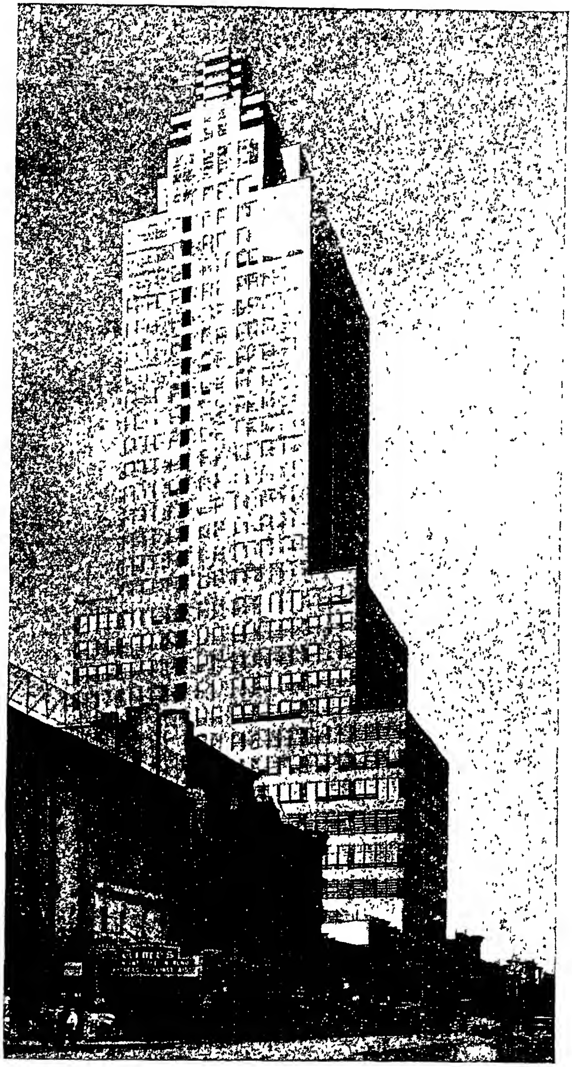
the skies, 300, 500, 1,200 feet. But the thinking and training of the architect, his schooling to the past, stayed his hand, prevented direct statement of the building as machine, of its function and its materials. As a whole, the skyscraper building is transitional, compromised, half-effective.

Elie Faure wrote of "that audacity of the Americans in erecting monstrous constructions which shatter all known styles, in the brutal rush toward the sky of their metal framework, and in their continual effort to rise higher above the cities." This was the climax of the will to create an empire of steel and concrete and machinery. But just as the early industrial kings thought they could buy, out of their imperial New World gains, a share of the culture of the Old World, so the skyscraper builders, not realizing that they *had* shattered all styles by their daring, imported traditional scraps of architectural dressing, and covered over, feminized their structures. As a group exhibit, the business towers of America symbolize industrial power plus artistic impotence.

Expression of the spirit and the function of contemporary skyscraper building has resulted in two opposing architectural type forms. The one follows the international tendency to establish the horizontal accent as basic style mark of all Modernism in architecture, with the steel spandrel or floor member becoming, accordingly, the dominant appearance fact. The other employs the verticals as most logical members for visual emphasis. The McGraw-Hill Building in New York, and the Philadelphia Saving Fund Society Building, both studies in the horizontal, are undoubtedly among the most consistent skyscraper achievements, the Philadelphia building marking in particular a creative manipulation of essentially machine-age idioms. But to cite them as the only examples of functional expressiveness among the skyscrapers suggests a new dogmatism on the part of one school of critics. The News Building in New York seems as completely expressive as the McGraw-Hill. It lifts and soars and there is an unimpeded upward



Philadelphia Savings Fund Society Building. Aspiring lines varied with repeated horizontal accents. Howe and Lescaze, architects.



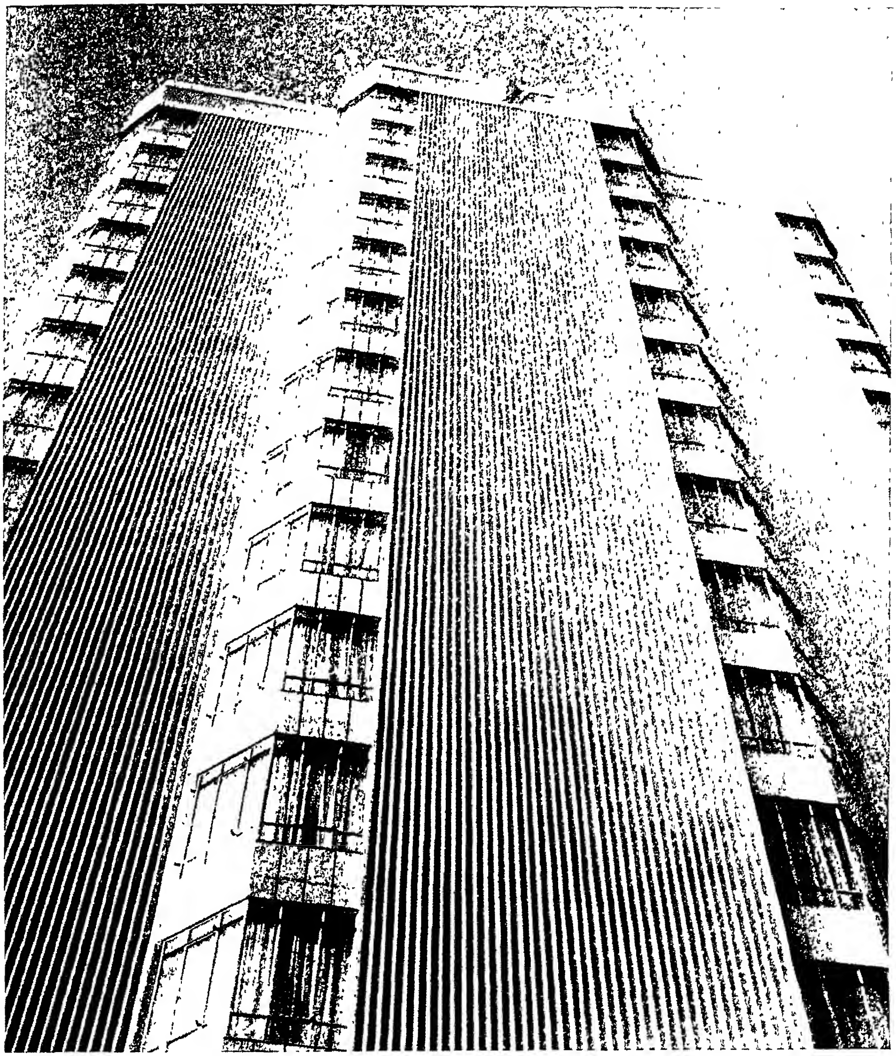
The McGraw-Hill Building, New York City. An example of repeated horizontal banding as appearance dominant. Raymond Hood, Godley and Fouilhoux, architects.

drive in its form, felt as better dramatization of the reach for air and light—the pushing, competitive ruthless will to dominate, which for better and for worse is still a motive of the unplanned industrial age, more dominant than that human ideal which brought the vogue for long low building.

There are, indeed, at least a score of skyscrapers in the country that acceptably (though not inspiredly) represent architecture conceived as the industrial designers conceive the making of a refrigerator or a penknife. First—a negative virtue but important—every vestige of the old ornamental modes has been stripped away; second, design is not concerned primarily with façade study but with expression of structural and functional truths. The structure is accepted as a honeycomb complex of lighted spaces; accenting of the piers marking the "stilts," *or* of the cross-members marking floors, affords a basic rhythm for the form. The building is recognized as a highly intricate but efficiently unified machine, with elevators, telephones, plumbing, power and lighting conduits and fixtures, insulation, heating and cleaning apparatus, and minor mechanisms; and the machinery is no longer hidden behind florettes and columns and garlands, but its spirit is echoed in machine-clean edges, flat walls, and flash of metal and glass.

Outwardly this is the aspect that links the new building clearly with the industrial work of Loewy and Dreyfuss and Sakier. We have described their designed machines and mass-produced objects as having typically: clean simple form; uninvolved massing; long, unbroken lines, hard edges, smooth contours; and sheer surfaces that flash and glow and gleam with the brightness of new construction materials of metal, glass, and plastic stuffs. The description may be said to apply as well to the visual aspects of the best skyscrapers.

A home, perhaps, will afford a better example of the affinity between an architectural interior by Lescaze or Neutra and a clock redesigned by Gilbert Rohde or a locomotive by Kuhler. The skyscraper discussion may



Edmond Meany Hotel, Seattle, Washington. The repeat motive and aspiring lines dramatized, but function sufficiently declared. R. C. Reamer, architect.

therefore be terminated here with the observation that the several illustrations are chosen to indicate the emergence of certain appearance idioms unknown to the past, to emphasize a style likeness evident in them, and to identify the aesthetic of the architects with that of the industrial designers discussed in earlier chapters.

The aesthetic might have been traced from Louis Sullivan and Frank Lloyd Wright in a direct line to the designers of these buildings. The one, who first insisted that function must determine form, and the other, who reversed the artist's thinking and proclaimed the machine as a peerless new tool, demanding that the building as mechanism be not masked but expressed—those two pioneers laid the foundation for the architecture crystallized in Howe and Lescaze's Philadelphia Savings Building and in Raymond Hood's News Building. Without their pioneering the somewhat compromised functional statement of the structures in Radio City, of the Irving Trust Building, and of Ely Kahn's commercial complexes, would have been far more involved in traditional masonry methods. As it is, these near-Modern structures, if studied, may aid the average person in forming a picture of the new architecture as a recognizable entity, as born of machine consciousness, and as an explicit manifestation in the field of industrial design.

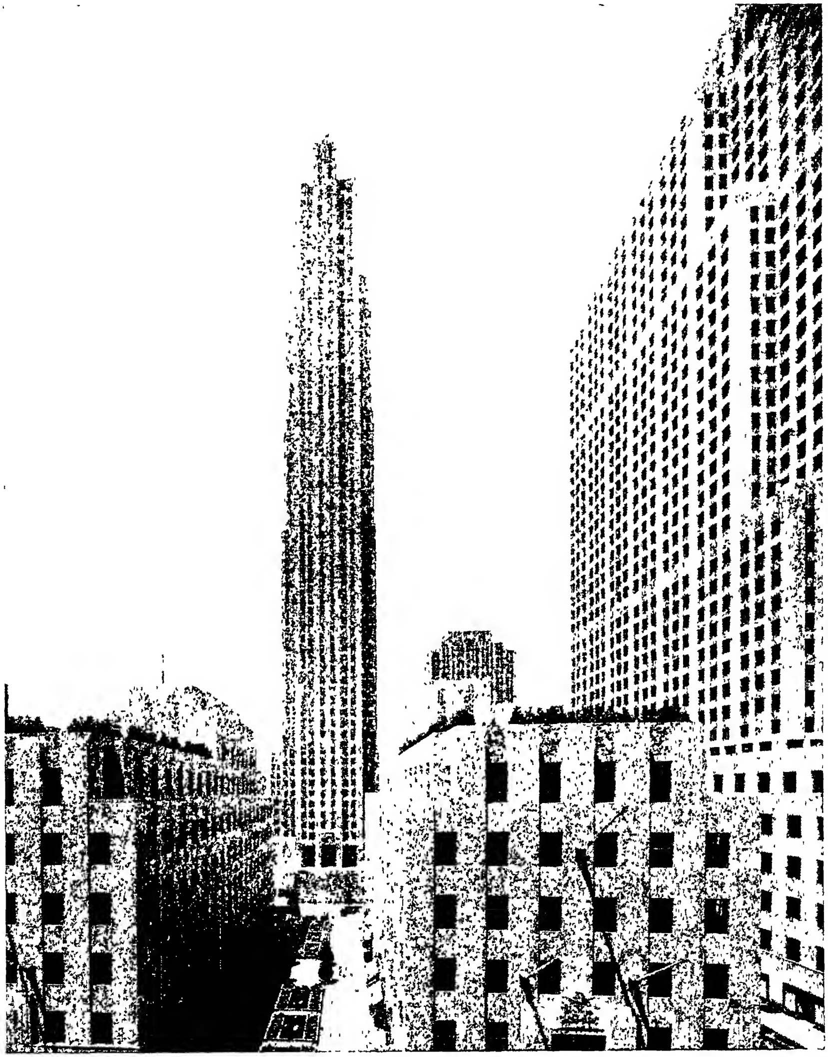
In the New School for Social Research in New York the machine reminder is exceptionally strong, particularly in the blocklike form of the exterior and in its coloring, with emphasis on the blacks. The building as a whole, however, is richer in coloring than most architecture based on Functionalist principles. The designer, the late Joseph Urban, known in America in earlier years as a leader in the field of the new stagecraft, as designer of stage settings, was originally a member of the inner circle of artists that gave Vienna its reputation as world center of the new decorative movement. Urban brought to America with him the Viennese love of sensuous pattern and exotic color. A large part of his work in America leaned toward a

rather lush stylization definitely removed from the field of machine-age simplification and functional expressiveness. But in other cases he did the extremists (and the public) a service by proving that pleasing color and enriching detail could be brought to the rational building without destroying the organic unity or obscuring function. Except that the entry hall seems unnecessarily forbidding, the New School building is one of the best examples of invitingly livable Modernism in the country. The theater especially pleases by its form (which is both acoustically functional and decorative); and the school floors are spacious and colorful, with enough of horizontal emphasis and metallic trim to carry through the accent felt in the exterior. The school authorities and the architect have not thought it irrational to enrich the structure with mural painting.

It is said that Joseph Urban "did the coloring" of the buildings at the Century of Progress Exposition in 1933. If so, he was merely doing his best to patch up what was essentially a bad job when judged by any truly Modern standard. There were doubtless nice bits here and there in the complex of Modernistic structures; but nothing could have been conceived by a method farther from that of the industrial designer. This matter of turning the job of coloring over to Urban *after* the buildings had been designed was in itself indicative of unfunctional approach, of a violation of organic processes. The actual damning truth is that there was no unified plan for the architecture in the first place. The exposition was a commercially inspired collection of echoes of surface Modernism, and ill served a public that might have been shown an instructive example of large-scale planning in the spirit of industrial design.

The home, because it is comparatively small, standardized in its mechanical functioning, and fitted to the unitary intimate need of the average citizen, affords the ideal illustration of the architectural problem solved by the industrial designer's method. The new theory of the building

The News Building, New York City, New York. The rising piers emphasized, with the cross members affording a secondary rhythm. John Mead Howells and Raymond M. Hood, architects.



Radio City, an advanced experiment in coordinated building design, in New York City. Reinhard & Hofmeister, Corbett, Harmon & MacMurry, and Hood & Fouilhoux, architects.

art sketched at the beginning of the chapter, implying an approach through consideration of space made livable, is exemplified in the most vivid way in the typical Modern house, with its cantilevered terraces, its horizontal proportionings, and its screen walls of glass brick or metal-bound window units. Here are the best examples of the new spaciousness; of the extent to which mass-fabricated parts are relied upon; and of the externalization of an integrated, mechanized living design.

Punch recently published a picture of a peaceful hillside farm with cows grazing, and at the back a very modern-looking sheer-wall house. One of the farmers, shown astride a work horse, is saying to the other, "Your new farm house, Jan, do seem to make the cows look turrible old-fashioned."

There is a point here. Much of the new architecture seems at first to make familiarly prized things, not only cows and frilled curtains and gilt picture frames, but grand staircases and cushioned chairs, "old-fashioned." There are even those who assert that human beings are going to feel out of place under any roof if the present rationalist trend in design is not curbed. And indeed we all have seen examples of extreme hygienic purism in design which made us apprehensive, lest after all this thing might become too severe, sanitary, and colorless for human endurance.

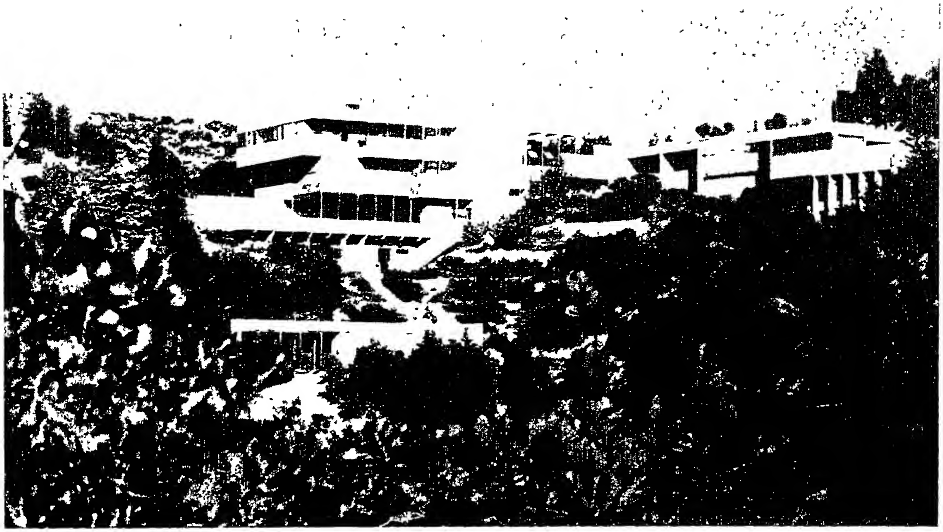
Nevertheless Jan and his family will stick by their modern house, be contented in it, and passers-by will become accustomed to seeing cows in this setting. Long ago some farmer with advanced ideas built a cottage in the then very modern thatched-roof style, and surprised his conservative neighbors into the same remark. And long, long before that some very devil of a revolutionary let window slits into his solid mud hut. And doubtless that, too, made the cows look very old-fashioned.

In short, cows, being natural objects still useful to man, will move along without too much wrench into each succeeding environment he may shape for himself, and find perfect setting. And men themselves continue

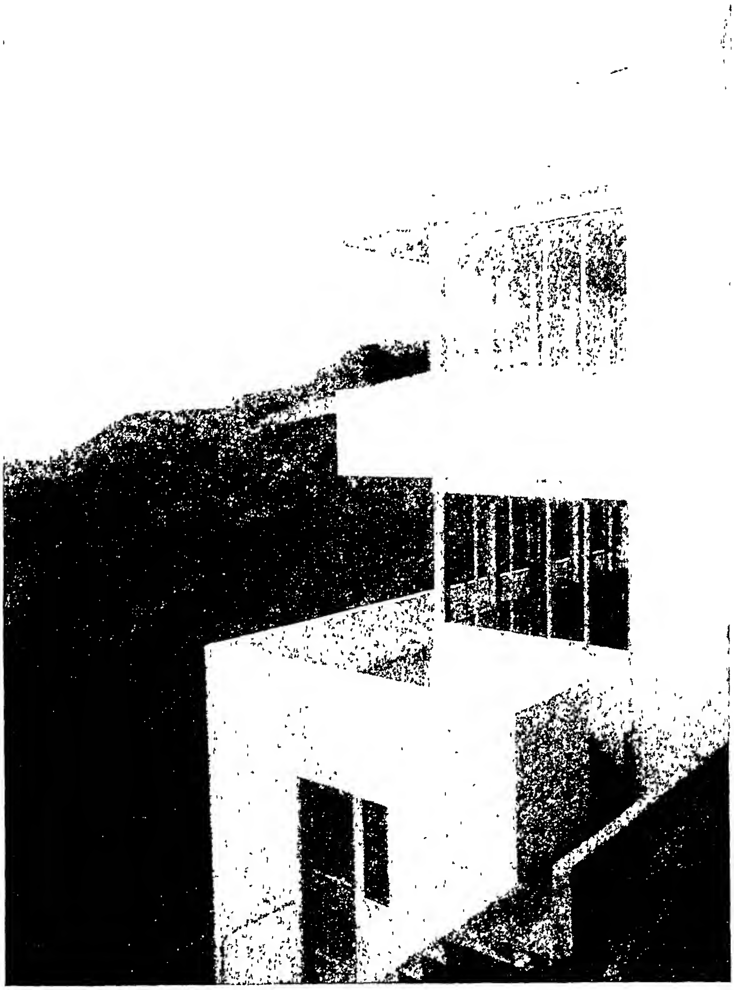
the immemorial progress by invention, retardment through custom, and final move forward because logic proves itself in the new thing.

There is logic in the new house. It is scaled to man, designed to serve him. Let us take the single analogy of the motorcar. No car owner today will put up with a transportation mechanism that does not work smoothly, efficiently, and flexibly, and with its virtues externalized in appearance values. But most families still live in houses that work badly, if they do not entirely belie machine function by their kinship with the fortress like wall building of the past. This irrational medievalism the new Functionalist challenges.

A recent commentator on modern architecture (writing anonymously in *Fortune)* ties the case for the inevitability of the machine house upon this one matter of owner expectation of workability. He sees Modernism triumphant, as soon as building is widely resumed, because the common citizen will expect motorcar perfection in house engineering, and motorcar honesty in house appearance. "Briefly what has happened in the last decade is this. The various domesticated machines like the automatic heater, the automatic electric refrigerator, the all but automatic electric stove and washing machine, the automatic air-conditioning system, together with all the lesser mechanical gadgets that have bred in the home, have predisposed urban Americans to think of domestic services as primarily mechanical and as properly handled by automatic or semiautomatic devices. At the same time the automobile with its perfected coachwork and ingenious controls of ventilation and light has predisposed them to expect of the shell of the house an efficiency in operation and a suitability of purpose which their fathers, struggling with the clumsy wooden window frames of the nineteenth century, never permitted themselves to think about. In combination the two influences have operated to prepare the minds of the citizens for the engineering of their houses and the reconstruction of their shelters in terms of workability. And minds so prepared are prepared for Modernism."



Two houses illustrating "the new horizontality" and machinelike sheerness. Above, the Lovell Health House, Los Angeles; below, "Research House," Los Angeles. Richard J. Neutra, architect.



The Kun House, Los Angeles, California. Richard J. Neutra, architect.

The writer goes on to point out that machine-age functional housing in Europe is largely a result of theoretical reasoning, whereas in America the highly developed core of machinery, the complex of domestic mechanisms actually working, is already in the house vitals, for the architect to understand and express. It was the French-Swiss theorist LeCorbusier, of course, who invented the term "the house as machine," thus giving concrete application to Sullivan's dictum about form and function. But it is the Americans as a people who have made the common house a working machine, to an extent that would indeed have seemed to their forefathers, in prophecy, fantastic if not altogether unbelievable.

There are rare American concrete examples, too, that show characteristic idioms in their dramatization above all of workability. Aside from the buildings by Frank Lloyd Wright, who more than any other architect historically foreshadowed the emergence of the machine-age spirit in architectural expression, the most instructive examples are by a group of architects who came to this country from Europe, particularly Lescaze and Neutra. They believed, no doubt, that the land most committed to machines in living would be the best land in which to create a machine-age architecture. If they met unexpected obstacles, an almost unshakable conservativism, as Sullivan and Wright had, they at least persevered without compromising their radicalism, and from 1930 they have prospered far beyond the average. Indeed Richard J. Neutra in California and William Lescaze in New York alike report that "for the true Modern designer there has been no depression."

Critics of Neutra's extreme functionalism affirm that he is not an architect at all but a building technologist. If architecture is to cling to its old status as a decorative profession, then Neutra would be the first to abandon it for engineering, technology, or—as we prefer to term it here—industrial design with special reference to building. He is ruthless in stamping out the last vestiges of period ornamentation, and jealous that the house shall look

exactly what it is, as is Dreyfuss or Sakier in approaching a refrigerator job or a design for a unit bathroom.

The Lovell Health House which Neutra built in 1927 on a hillside above Los Angeles was one of the earliest demonstrations of "purest" functionalism in this country. It was in line with the most advanced world thought in this field, with special characteristics due to the location and the intended use as doctor's residence and private sanitarium. The aspect perfectly bears out the architect's assertion that he had no money to squander on traditional decorative embellishments. By the lightness and strength of the materials used and the resultant interlocking pattern of inside and outside spaces, with a prevailing atmosphere of brightness and cleanliness, he achieved his intention of arriving at a new aesthetic statement. Here as in the later Research House and in the home for Anna Sten, the light metal skeleton and the large areas of glass, the sun traps and open terraces, proclaim the openness characteristic of the space conception of architecture as against the conventional heavy-wall thinking.

The appearance of these buildings is as machine-like as the extremest rationalist could wish. Regularity and repetition are capitalized. The wall sections are kept sheer and gleaming. Horizontal lines are elongated and emphasized to the extent that one of the houses, seen from a certain approach, appears as a composition of bands in alternate materials. Beyond this aspect, so truly speaking of concrete, metal, and glass, of light and sunshine captured, there is, in the structure, the honest, deep-lying manipulation of parts and materials for greater functional service.

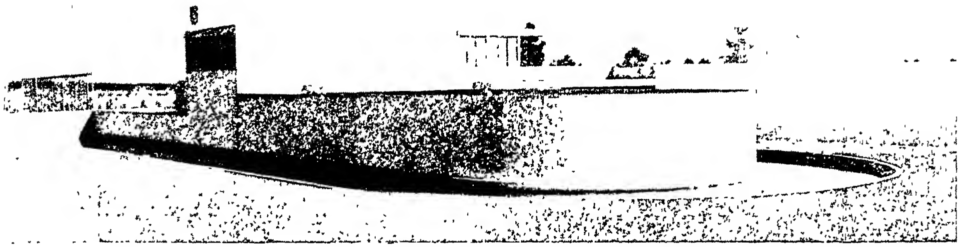
Neutra has recorded that he studied for two years the structural, utilitarian, and human values involved before he made his final design for the Health House. Geddes' now celebrated line, "What is a bed for?" which he said was his first question when facing the responsibility for producing "new" bed designs, might be paraphrased in a statement of the contempo-

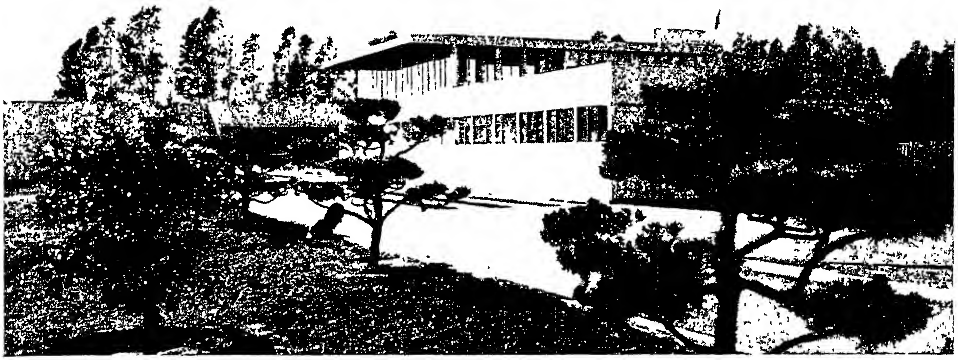
rary architect's approach to a building problem. Neutra spent two years considering the question, what is a house for? What makes it run efficiently and smoothly? How is it fabricated? Out of the answers he found a way of expression.

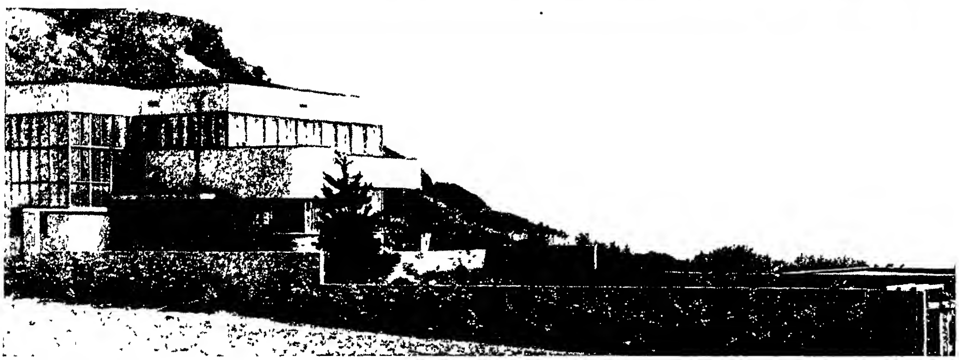
The economics of architecture has been a passion with Neutra. He looks to standardization and prefabrication to cut to a fraction the present costs of home building. He has tested new synthetic materials and has experimented widely with precast concrete slabs, unit-system metal framing, light reflectors, and cantilevered members. One of his best known experiments is a house combining areas of glass and exposed aluminum-coated copper-bearing wall elements (which he has utilized also in subsequent structures). He has developed not only new systems of house heating but an entirely new theory. He has used extraordinary systems of sliding partitions to make room space doubly serviceable. Today's porch of his own home may be part of the living room tomorrow, and a porch again the day after. The kitchen as he designs it is as nearly automatic as present human inventiveness can render it.

This all is part of architecture in the industrial-design sense. One remembers that Neutra, like Lescaze, is a designer far beyond the strictly architectural field. Seeing the ingenious working of his domestic mechanisms, including a device for automatically catching the crumbs when the built-in bread-box cutting board folds up, one recalls his expertness in the field of land use and the fact that his city plans, including visualizations of "Rush City Reformed" were published and widely circulated in many countries. In the new conception, everything from a bread box to a city *is* architecture—and industrial design.

There are examples to show that the machine-like austerity of the house may be modified by the use of furnishings and even decorative variations without in any way losing its functional and organic integrity. Such an





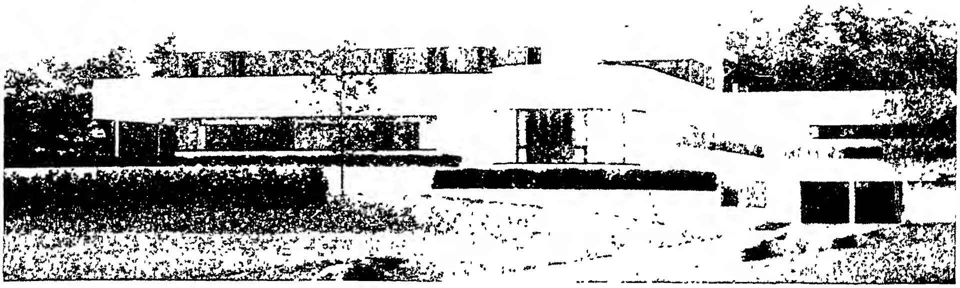


Industrial-design methods in architecture, resulting in typical machine-age appearance idioms. Two views of the home of Joseph von Sternberg, San Fernando Valley, California; below, the house of Anna Sten, near Hollywood, California. Richard J. Neutra, architect.

achievement, leaning even toward the luxurious, is to be seen in the Mandel house at Mt. Kisco, in the rolling Westchester hill country suburban to New York City. This typical example of industrially designed architecture is more than is usually the case a collaborative work. The architect, Edward D. Stone, worked practically in partnership with Donald Deskey, industrial designer who calls himself in this case "interior architect"; and to complicate the relationship and the distribution of credit, the owner of the house, Richard Mandel, is an associate of Deskey in his design work. He labored continually with the other two in arriving at the total architectural solution. The result is one of the most pleasing monuments of the new building in America. Naturally there is a special sense of unity in house and furnishings.

If the machine-age element is most apparent in kitchen and bathroom, it is strongly felt also in both inward and outward aspects of the structure. The exterior illustrates perfectly the suave Modern manipulation of banded windows and horizontal ribbons of concrete, with crisply squared corners varied by one flowing curve where a rounded bay is introduced. There are also the common structural idioms of overhangs supported on the slenderest of pillars, and set-in sections or screens of translucent glass brick. But again it is the sense of spaciousness that is most notable, and a general cleanliness of form. It is typically the machine house, but out of a sense of the machine as purveyor to man's comfort and convenience in living.

Donald Deskey's furnishings, for once seen in what he considers an ideal setting—still a rare experience for designers of furniture, textiles, and gadgets—seem perfectly of the picture, on occasion adding color and warmth, at other times reinforcing the sense of metallic flash and gleam, echoing the basic horizontality of the design. To preserve the spacious atmosphere has been of more importance than building in coziness. As in all true Modernism the erring if any is on the side of unadornment rather than toward Victorian stuffiness and disunity.

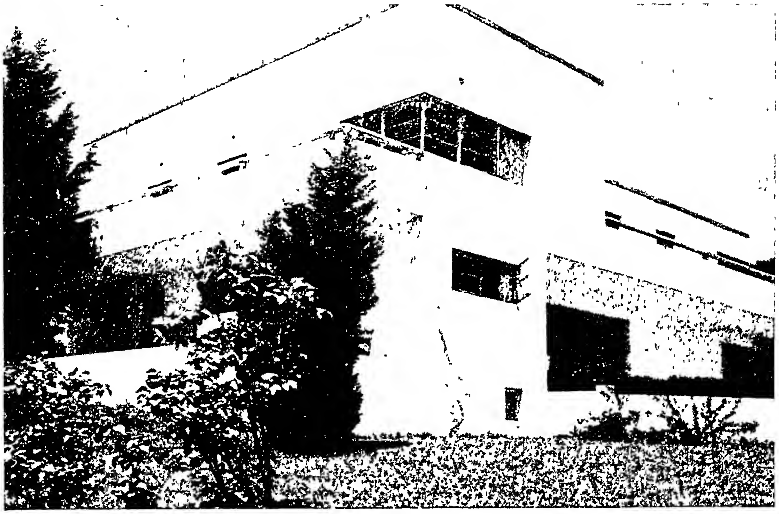


House of Richard H. Mandel, Mt. Kisco, New York. Typical expression of the new materials and methods of construction. Edward Stone, architect; Donald Deskey, codesigner.

A house of slightly earlier date, obviously conceived in the same spirit and directly a product of industrial-design practice, is that known as Contempora House, erected by Paul Wiener at New City, New York. The famous Viennese architect, Joseph Hoffmann, a world master of Modernism, made preliminary sketches or suggestions. With them as basis, Mr. Wiener, a designer who entered the industrial field in New York as early as 1927, made the complete plans, then supervised the building.

Again the characteristic visual elements appear in both exterior and interior. The spacious atmosphere prevails. Long horizontals are accented on all façades and in the simple covered passageway linking main residence and dependent studio. Everywhere porches and terraces provide for open-air life. Glassed areas begin at the floor line. The distinctive machine-like aspect is implicit in the cantilevered forms, the precise proportionings, and the gleaming, white stucco finish (over porous cinder blocks). It is doubly emphasized by the aluminum window mountings and the narrow aluminum bands used as wall-top coping.

It has been remarked that the Wiener house as seen from its garden setting has a classic air of simplicity, serenity, and rightness. It is not severely functional in the manner of the early machine-age building, but is rather a mature and considered expression, typical of approach to the time when the machine shall have become fully man's servant. It results from a mature design philosophy. Paul Wiener feels that the present time is that of Modernism's coming of age. The new engineering should be taken for granted as a determining factor, but should not be self-consciously proclaimed in every line and contour. He is as chary of ornamentation as the extremest Functionalist, and the total aspect of the building is eloquently clean, powerful, and uninvolved. But he points out that the hard blocks and sharp edges of machined forms are not ideal for the intimate human environment. He therefore proceeds to build into his structure answers to the immemorial needs

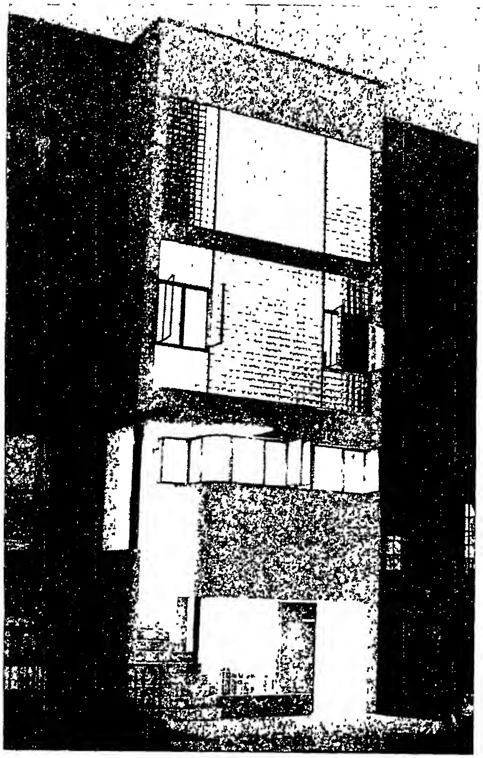


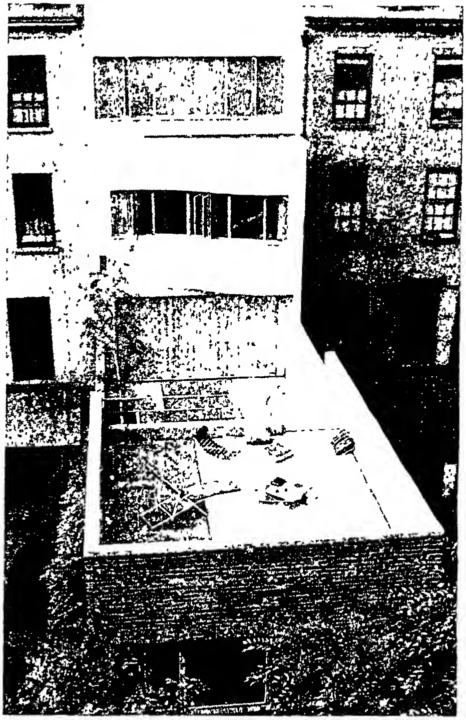
Contempora House, New City, New York. Paul L. Wiener, architect.

for warmth of color, variation of line, enrichment. Square forms are sparingly relieved by an occasional round one. The beauties of out-of-doors are brought in and everywhere multiplied by the use of construction glass and mirror glass. The house was initially "fitted" into the trees. The color and light harmonies of the interior were subordinated even to the last detail to the unity.

William Lescaze came to America because he found European building "too damned monumental." The ancients had built big, palaces for royalty, cathedrals and temples for gods; and later builders could not get free of the imitative obsession, the desire to impress by largeness and score by decorative profusion. But when he arrived in America he found the same illogic at work. No one wanted an architecture scaled to six-foot man and suggesting the machine which had become the type fact of his way of living. It was only after years of struggle, discouragement, and perseverance that he showed a few people the logic of the new industrial design in building. In 1936, he is a leader in Modernism. (The monumentalism, of course, continues too. Only last year Lescaze inquired what sort of man and records the new Archives Building at Washington was intended to accommodate, with its doorway 39 feet high and 9 feet wide.)

The building of a city-bound house brings special limitations in manipulating the Modern architectural elements, and it might be fairer, if we were merely judging and placing the architect's work, to choose for description and illustration some of this designer's out-of-town structures. But it is more to the point to mention here his unique solutions of city home problems. In New York, within monotonous rows of brownstone masonry façades, Lescaze has twice set houses that dramatize by contrast the conceptions of cleanliness, openness, and simple statement. The surrounding Victorian buildings, faithful to the tradition of architectural design as a matter of heavy load-bearing walls punctured with windows at intervals, are dark and forbidding beside





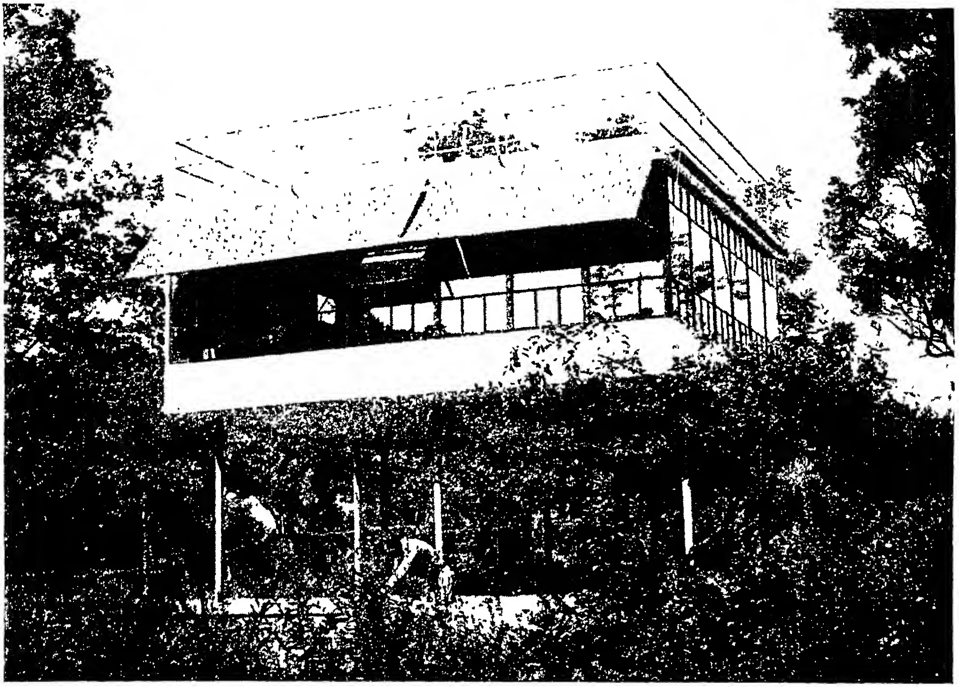
Front and rear views of Lescaze house, New York City, indicating typical modern means of capturing light. The curved line of the rear façade is a device for gaining additional advantage of sun and view. William Lescaze, architect.

them. The Lescaze compositions bespeak light and spaciousness, the two elements most difficult to conserve on narrow city lots. The surviving outside wall space is hardly more than narrow bands surrounding the all-important glass areas. The absolutely flat finish and the gleaming white of the cement add to the electric-age expressiveness. Certainly the total exterior design appears more decorative than any other buildings in the neighborhood, albeit stripped of every shred of conventional ornament.

That the newly invented materials, whether in architecture or in smaller industrial design, afford in themselves an appropriate decorativeness, can be instanced more particularly in the areas of glass brick which Lescaze freely utilizes. The ornamental or patterned effect becomes doubly apparent when the "screen" is set within sheer walls, as here. The material is of course adopted primarily for its functional service in admitting light without giving visibility. The vacuum glass brick is, too, valuable as part of the scientific heating and cooling system, retarding unplanned changes in the temperature of the interior.

These two city homes are perfectly in keeping with the country houses already shown, and no less with the most advanced skyscrapers; and the design language throughout the range of new buildings is then seen to be exactly that of the motorcar or ship builder. To the observer who believes that his mind is emancipated from traditional ornamentalism, and monumentalism, Lescaze's success is argued by the fact that the design of his houses seems motivated by principles that result in airplanes and liners.

If the streamline was adopted from the airplane as symbol of a quality, almost a style implicit in the new travel machines on land and water, there is no less a related architectural emblemism in the sweet cleanliness, the fresh brightness, and the spaciousness of these houses. The interiors repeat the notes of simplification, efficiency, and open expressiveness of comfort as an elementary consideration.



Vacation house, Northport, Long Island, New York. Evident functionalism and use of standardized materials. A. Lawrence Kocher and Albert Frey, architects.

It is necessary to add, unfortunately, that America has been particularly backward in adoption of the rational house. The examples cited are still by way of exceptions and prophecies: much more so than in the case of refrigerators, clocks, and washing machines. Comparatively, the Europeans have gone much further in practice, particularly in Germany, Austria, and Holland, where one may encounter whole suburbs of Functionalist housing. Between the pioneering of Frank Lloyd Wright and the emergence of Lescaze and Neutra as leading architects, there was extraordinarily little Modern building.

Wright is the one continuing and binding figure. If his buildings are less illustrated here than might be expected in view of his world influence and his forty-year service to Modernism, it is because we have preferred to use the starkest examples of Functionalism we could find, to indicate the identity of the new architecture as part of present-day industrial design (which, as we have noted, is still in the primitive ultrasimple stage). No one has gone deeper than Wright in study of the expressive values of materials; no architect has more jealously fought for honest expression of function; certainly no one else has designed so many landmarks of Modernism; but he insists that the general run of new architecture—especially that sometimes termed "the International Style"—represents only a beginning of the creative designer's work. He believes that the true artist in building goes on to add a distinction and an enrichment generally lacking in these self-consciously simple compositions.

The early houses he built, even while establishing the new world standards of horizontality, cleanliness of line, machine-age fabrication, and space consciousness, were unfailingly touched by a warmth and distinction that were an individual artist's contribution.

Some of the extremer Functionalists feel that this personal expression removes Wright from the ranks of the true rationalists: that uniformity of

aspect, a certain impersonality of statement, is implicit in the machine-age idea. Others, seeing that it is only the mechanism and the structural basis that need be regularized, find in Wright's work a step beyond that of the dogmatic practitioners. The Millard house in Pasadena, for instance, though built of such modern material as precast concrete blocks, and marked by the characteristic sharp-edged cube forms, is enriched by the simple and logical expedient of mass-produced ornamented blocks instead of plain ones. The effect, in Wright's creative manipulation, is colorful, almost jewel-like. The example is as far as we shall go in this book toward suggesting appropriate enrichment, a possible additional distinction through original ornamentation, beyond the functionalism that is basic. To make the story nearer complete as regards Wright's contribution, it may be added that he has prepared a series of models, in connection with his plan for "country cities," which challenges his younger colleagues on their own ground of utter simplification. It is only one more phase of the sunlit house he was designing thirty years ago. "Extended lightness, spacious openness, a firm cleanliness of line": these, with his foundation principle of organic design, place him as veteran and peer among the industrial designers in architecture.

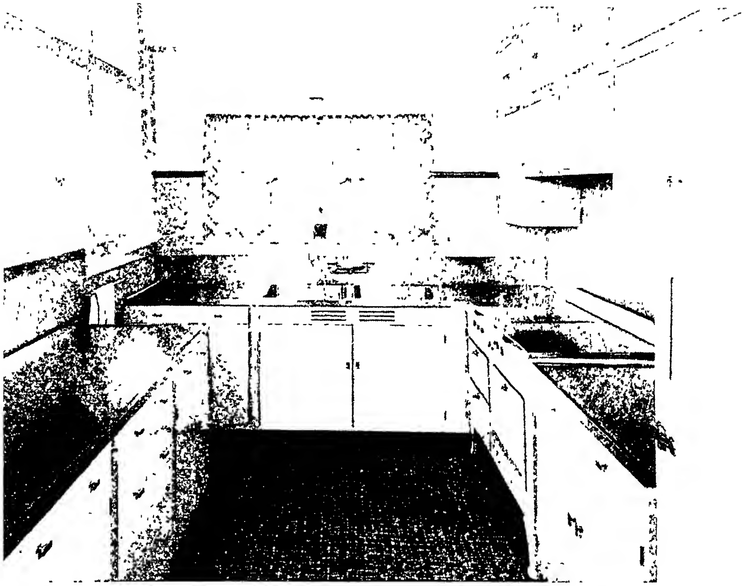
It is interesting to note, *en passant,* that LeCorbusier, who began his manifesto in 1923 with the statement, "The house is a machine for living in; the 'styles' are a lie," ended a recent interview with the statement: "This aim dominates everything: tear Man away from the chaos of the first machine age; bring to him his 'essential pleasures.' " Perhaps the second machine age is to be less impersonal in expression than the early Functionalists admitted: less standardized, less stripped, more humanly individualized.

Lescaze admitting enriching variation in his straight-lined Functionalism; Wright training a new generation of students to the dual ideal of organic structure and individual expressiveness; Wiener explaining that he takes the functional obligation for granted, then proceeds to "liquidate the

sternness of the architecture"; and architects whom we have not so much as named—R. M. Schindler and Lloyd Wright in California, and Morris B. Sanders and Kocher and Frey in New York—attacking the problem of making the rationalist house more intensely expressive of human function, each at differing stages: these are signs that the self-conscious and dogmatic Functionalism of the days of LeCorbusier's first dictum is likely to be modified in various interpretations and brought closer to "man's essential pleasures." The machine is foundation, genesis, inspiration, and is not to be denied; but architecture will speak in terms of human service too.

There are other types of building, beyond office structures, school, and house, that spectacularly illustrate the use of certain new materials and new engineering methods, because their function is nearer to machine operation: hangars, planetariums, factories, incinerators, filling stations. But the lesson is better learned perhaps in buildings near to every man's experience: in office and home illustrations. The average citizen knows the mechanics of the house (even if he has seldom related that knowledge to architectural expression and 'style'); and it will serve the present purpose if he now discovers how the office machine or house machine becomes the basis for architectural planning.

It is obvious that man is in the early stages of the architectural revolution growing out of mass-production technology. Only a beginning has been made in the use of prefabricated units. From steel sheaths and glass screens to complete bathroom and kitchen units there is a range of exciting new possibilities of structural standardization. New metals are replacing old, new plastic elements promise to invade building as freely as they already have entered into the automobile-accessory and household-appliance fields; and these are materials peculiarly fitted to factory manipulation. Glass is appearing in vacuum bricks, as colored sheets for interior finish, and even as supporting columns. Concrete is poured, or delivered as standardized interlocking



The kitchen as industrially designed laboratory for food preparation. A redesigned kitchen furnished with stock elements and making extensive use of monel metal. *(Photograph from International Nickel Company.)*

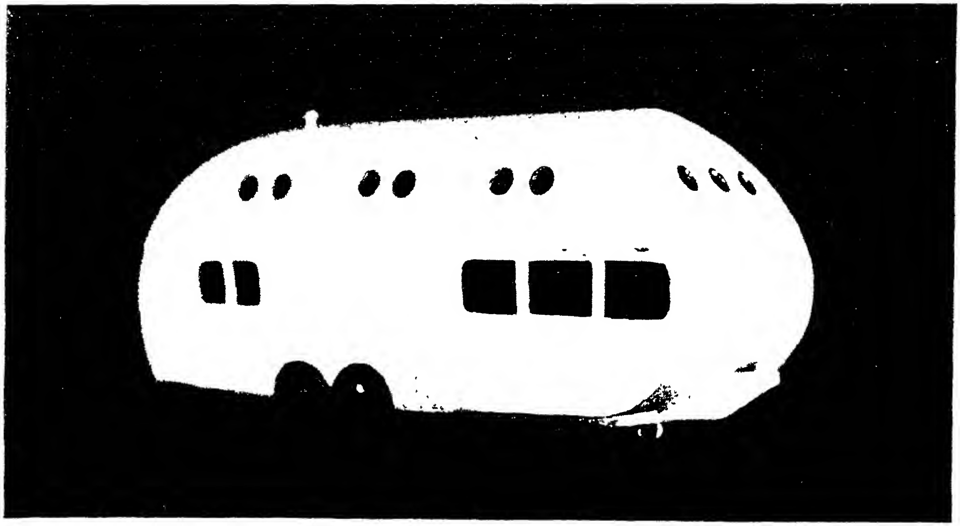
blocks or in slabs for flooring or siding. But most determining of outward aspect, perhaps, will be not the newly introduced single-material unit but factory fabrication of the core of the house: the deliverable total mechanical complex, including kitchen and bathroom elements and heating and conditioning center. How far we shall go beyond that, toward house ordering by number—all parts standardized and prefabricated, and sent to the site in sections convenient for quick assemblage—is a matter for speculation.

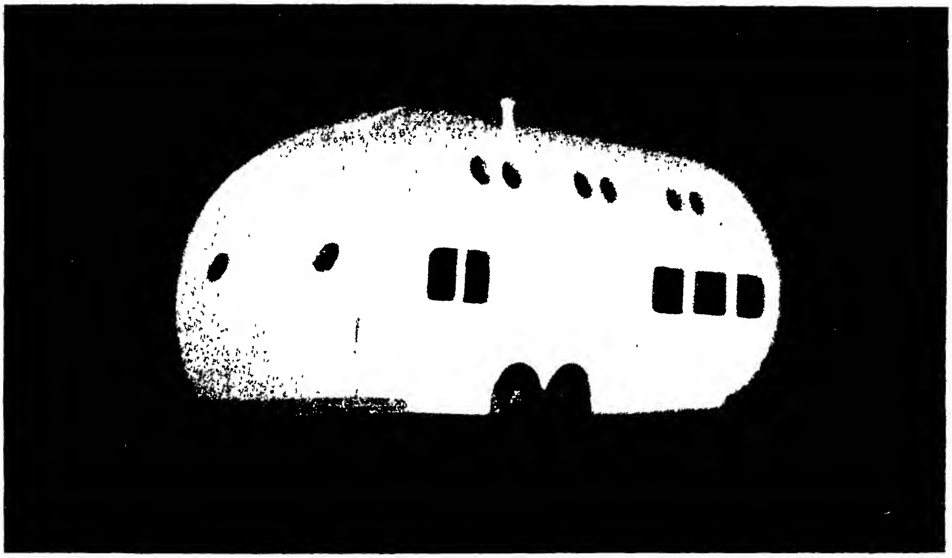
It is pertinent to our observations, and conclusions, that the prefabricated units now most often incorporated into building assemblages have been designed not by men associated with the profession of architecture but by the artists and industrial laboratory workers constituting industrial design. Most notable are the bathrooms planned by George Sakier for the Standard Plumbing Supply Company, deliverable in three sections (each comprising a major unit of plumbing, its accessories and adjacent wall); and the kitchen units developed in the General Electric and Westinghouse laboratories and similar experimental centers.

A related achievement (paralleled already in plans by several other designers) is that of Walter Dorwin Teague in producing for the Texas Company a filling station basically standardized yet adaptable to minor changes demanded by site, climate, and varied materials. Of course this is an exceptional problem in that the mechanics of a building seldom so definitely controls the structural features. Machine has almost become building.

There are already on the market complete prefabricated homes, but we have not felt, in these, expression of the pioneering inventive genius and artist contribution that are elsewhere being combined outstandingly. Here is, nevertheless, one of the certain directions of future development of a typical machine-age architecture.

Both the architect and the industrial designer have been puzzled by the tendency of their fields of activity to fuse. A few architect-engineers have





Model of "the Mobile House," by Corwin Willson; a very light, shell-like portable structure, with four rooms on two floors.

been able to broaden their interpretation of design sufficiently to carry them over easily into the new work, Lescaze and Neutra in particular. But the bridging has been done more often from the other side. Wiener, Deskey, Teague, and Loewy are among those who have invaded the building field after practice in machine design and commodity design. Geddes has measurably affected theater building and even factory design by his models, and has made advanced studies in housing. Frederick Kiesler is another general designer whose work has carried over from his better known furniture and stage settings and rooms to actual building design.

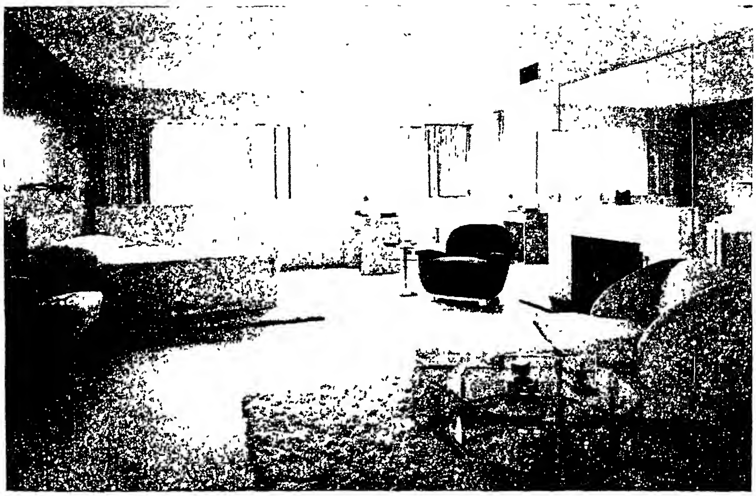
Naturally, the identification having been established, each professional group has been of the opinion that it might better take over the work of the other. Out of the conflicting claims one truth comes clearest: no architect is long going to practice influentially if he does not adopt the typical industrial-design approach; if he does not come to his work more as engineer than as decorator. The trend in the architectural schools, the testimony of the architectural press, and shifting currents in what public demand there is, indicate as much.

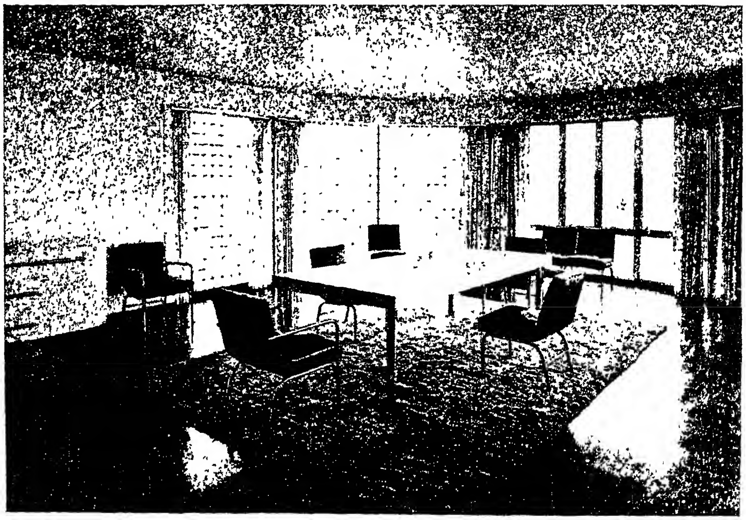
Harvey Wiley Corbett, leading architect of the progressive or liberal school, has spoken out for the established profession in these words: "In these days of specialization we are apt to think of industrial design as something very different from other forms of design and therefore requiring a different approach, a different training, or a different technique. But I think this is wrong. . . . I am an industrial designer myself. The objects of industry on which I expend my design effort are office buildings instead of egg beaters, but I fail to see wherein my background of training and experience does not equip me more effectively to design egg beaters than the background of the egg-beater specialist qualifies him to design office buildings.

"Design is something generic and all inclusive, not something special and limited to a fixed field."

Corbett, the late Raymond Hood, and Ely Jacques Kahn have been most successful in the attempt to bridge the distance between the old Eclectic architecture and the new industrial-designed building. Each one illustrates in a personal contribution the evolution from appropriate styling to reflection of Modern thinking. Each, in latest buildings, has succeeded in bringing a considerable portion of the typical machine-age sheerness and light into exterior design. The downright Functionalists, of course, count this considerably less than a basic and revolutionary advance. We need not labor the point here. For our purpose of defining industrial design in its broadest sense, Neutra and Lescaze and Kiesler are the true exemplars, the new untrammeled creators of "space sheltered and machined for living, in artist expression." And so we find it significant that Loewy should be made consultant to all the "regular" architects designing Greyhound stations; that Deskey works in partnership with Stone; that Teague is redesigning the Texaco stations.

The conclusions are inescapable. Under the new way of living, architecture is industrial design. Already it has begun to appear machine-made, most beautifully so where actual industrial designers have stepped over into the once sacrosanct realm of "the mother art."





Interior of the Mandel house, Mt. Kisco, New York. Sense of "the new horizontality" and of spaciousness carried indoors. Edward Stone, architect; Donald Deskey, interior architect.

9. INSTEAD OF INTERIOR DECORATION

THE character of the exterior is reproduced and emphasized in the interior. The quality which makes a single house set lonely and remote on any hill-top the world over unmistakable, self-proclaiming Modernism, distinct from buildings of all former periods, becomes the quality of the interior as a whole, imparts itself to each individual element of that interior, and is equally impossible of confusion with anything else. The same fresh creativeness and the same direct thinking are apparent on the part of the one group of workers as of the other, while each is busy at a separate stage of the problem of designing places for living and working.

A few pioneer architects like Frank Lloyd Wright, Henri Van de Velde, and Joseph Hoffmann took what was at first the extremely revolutionary attitude that, if you are going to have unity of approach, the three figures, builder, architect, and interior designer, must be merged into one creative engineer controlling the entire undertaking. That is the ideal. Some of the industrial designers, Neutra and Lescaze among them, still hold to the necessity for this treatment.

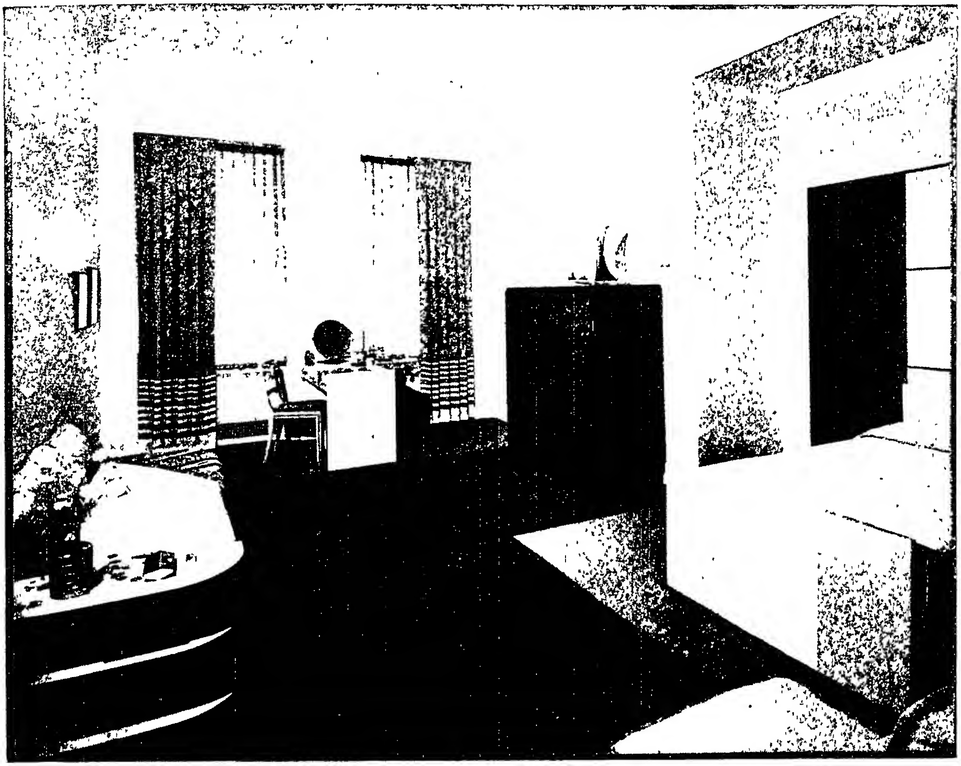
But it is an ideal difficult of achievement under prevailing conditions of building. Particularly in American cities, where the architect of skyscraper office buildings and multiple-apartment blocks relinquishes control the day the work is finished, where single apartments and office suites are periodically redesigned, the way is opened for a new subordinate profession. Other artists are called in. They are not wanted for service outside the one unit, and cannot radically alter construction lines. But within the three-, five-, or ten-room outline their work has its own unity and distinction. Even in Europe, well-known architects of the new order have had to turn to what in the old days would have been interior decoration as a means of making

a living. Certainly in America, where larger architectural Modernism has gained acceptance very slowly, the most outstanding progress has been made through the lesser achievement which we are discussing as interior architecture or interior design.

The interior architect is the industrial designer working as a specialist. This is Modernism's successor to the old-time "interior decorator," the man or woman who would have arrived with his repertory of style fittings and his function of selecting and grouping objects appropriate to enhance the interior effect. That person might have been commissioned to travel over the world to discover *objets d'art* for a particular *décor;* but nobody would have expected him to design anything. The new worker, on the contrary, has an ideal that is architectonic rather than decorative. His central effort is identical with that of the exterior designer, and is directed toward unity.

Donald Deskey, Kem Weber, Gilbert Rohde, Eleanor LeMaire, Russel Wright, William Muschenheim, Wolfgang Hoffman, Marianna von Allesch, and Robert Heller are among originators of a volume of work which has gone far toward establishing a prevailing consciousness of modern interior design appropriate to take its place in the new industrially designed complex. They are creating a new "geometry of forms" that is beginning to dominate American interior schemes, be it for home, office, little luxury shop, or large recreation center.

This is the industrial-design group which the public has come to know best. It is exerting the broadest and most permeative influence, because there is a universal appeal in the immediate everyday environment and whatever has to do with changing its appearance. Through individual and group exhibitions, through creations illustrated and discussed in leading periodicals, and shown (though not always discriminatingly) on the stage and in the moving pictures, a very wide educational service has been done. The design work of the group has passed into mass production, too, on a



Interior of the Shearn apartment, New York City, New York. Eleanor LeMaire, designer.

scale which will soon permit the homemaker in the most remote part of the country to plan her own interiors representative of modern design. Provided only that she has a reasonable budget and fundamentally sound personal taste, she can obtain well-designed pieces or sets representing any reasonable degree of simplicity or luxury. It is becoming possible to find them offered in the catalogues of leading mail-order houses.

Some of the workers have arrived initially at interior design in the large through special industrial designing in some minor quarter of the field. Almost every one designs such articles as metal and glass tables, clocks, toasters, and sweepers, and originates new accessories and appliances. Between those whose approach is from the side of the architect and the others who came in first as industrial designers there is essentially no distinction so long as the product is organic and creative. Both types of worker are furthering, each to a degree conditioned by individual ability, the production of that new geometry of interior forms already mentioned.

Donald Deskey is the most distinguished single figure of the group. To discuss what he does in any instance is to reiterate and exemplify the fact that the elements of the interior designer's work are three-dimensional rather than flat-pattern units. His ideal is an architectonic rather than a decorative ensemble. Deskey has the gift of an intensely personal expression, the mark of which he places upon the smallest and most utilitarian thing he takes in hand. He has, too, an exceptional sense of professional responsibility. These dual characteristics have given prestige to his name and made him a leader in the early efforts to arrive at a sound working relationship of art and industry.

Within a decade of the time he made his modest entry into the field in 1926, Deskey had designed numerous architectural interiors, including apartments in one of New York's most exclusive clubs, River House, and rooms for the New York home of Mrs. John D. Rockefeller, Jr.; and he had

been responsible for creation of the interiors of Radio City Music Hall, the largest theater to be undertaken anywhere up to that time, and the most extensive and ambitious scheme for bringing fine arts and fine craftsmanship into an industrial-design environment. The purpose was functional, in that the responsibility was for creating an atmosphere appropriate to the leisure-time enjoyment of great masses of people; and nowhere in the accomplishment of this purpose has the basic unity been disturbed by the interplay of industrial design against fine arts design. The example is typical of machine-age expressiveness held subordinate to a special set of requirements. These unique and individual instances would hardly claim mention in this discussion except that they explain and help to illustrate the dual work of most of Deskey's fellow designers.

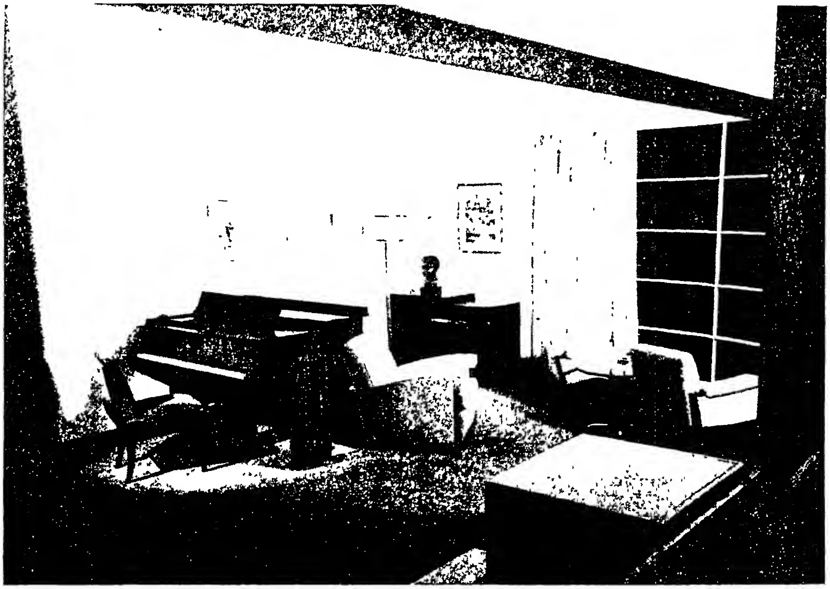
In the field of interior architecture and Modern furniture design, indeed, there is no possible hard-and-fast rule regarding admittance of machine-multiplied materials or objects and nonadmittance of those which are handmade or custom designed. In the nature of the varying problem of furnishing, and the limitations of machine manufacture and construction, there is continual alternation between the custom-made thing and the organization of predominantly mass-produced elements. The first test of modernism is in the approach by way of a conceived unity of impression, and a sound reliance at all points upon the typically simple, clean, honestly expressive effect. The parts may be made to order or be purchasable in the nearest shops; but if conception, plan, and assembly are unified and organic, the result cannot at this stage be denied the title of Modern. As a matter of fact today's mass-produced chair or bed or curtain is likely to have appeared yesterday as a specially made object in a custom ensemble by Deskey or Rohde or Russel Wright.

Deskey is the typical artist-figure bridging the "special job" and the mass-production fields. Simultaneously with creation of the distinguished

interiors mentioned, and others in Europe and South America, he made mass-production designs, carried on original experiments in uses of new materials, acted as industrial-design consultant for manufacturers, and even found time to stand over this and that factory worker, following the progress of one of his models through the successive stages of machine adaptation and duplication.

He designed a candy-vending machine in 1927, and later an oil burner and a motor truck. As early as 1930 his metal-tubing chairs were being turned out by a factory near Grand Rapids. The quality which gave them general acceptance before common use of metal had been made in stock interiors led to continuous demand for wider production of his furniture by separate pieces and in ensemble groupings. A conservative manufacturer in the early days exhibited a modern room of Deskey's design where revolutionary use was made of cork, asbestos, glass, and metal, in a scheme the total effect of which was extremely simple. Upon astonished comment that he had taken a sudden turn toward "the new Modern style," the manufacturer showed surprise. "That's not Modern style," he replied, "that's good contemporary American." The incident illustrates Deskey's peculiar ability to present advanced ideas in a completely acceptable form. There is a growing conviction about "good contemporary American" as embodied in the work of the group as a whole. William Lescaze sometimes remarks with a degree of certainty even greater: "We are the classicists of tomorrow, and none of us doubts it."

Kem Weber, practicing in California, is member of a small group specializing in the design of Modern furniture, a group in which Gilbert Rohde and Russel Wright are most representative in New York. Their contribution is in general less exciting than that of a Dreyfuss or a Loewy, for tables and chairs have not the thrilling connotations of locomotives and skyscrapers and X-ray machines. The manufacture of furniture, moreover,



A living room designed and furnished by Donald Deskey, with strong reliance upon abstract factors.

has long been an art-using mass-production process, and there has not been the sudden revolution in design evident elsewhere. But there is a Modern movement nonetheless in the field, and artists of the stature of Rohde and Wright and Weber are not to be overlooked in an account of contemporary industrial design. Their best work is as truly advanced and functional in spirit as the ensembles we are considering, and often finds place in them.

Rohde has been a pioneer in reconsidering the engineering aspects of furniture, and has contributed new types of bent-wood chairs and unit book-cases and cabinets. In regard to furnishing he points out that efficient use of room space is first to be considered, that a sense of unification through grouping is second, and that the individual piece is to be considered only after those factors. Thus he designs in lines, stressing standardized units which can be used elastically yet harmoniously. He considers first the purpose the room is to serve, and then undertakes to supply a related and consistently beautiful grouping for that purpose.

Rohde is insistent upon the point that typical Modern furniture is merely a return to original expression and logical production in terms of our own time, and therefore in line with the best creative design of the past. He believes that in this decade artists are making the progress that would have been made through a whole century if the machine had not been senselessly utilized to imitate handicraft prototypes. In developing a special type of design suited to new materials and the machine processes, designers are obeying a law valid in the stone age and among the Greeks and under the Louis: that craftsmen produce what is natural to the tool. Modern is not a breaking from tradition, nor is it a fad. It is this age's true answer to controlling conditions.

Russel Wright believes also in the value of traditional influences. He calls industrial design an American social art. "American design," he says, "should spring from native sources. Deflections such as *compromise classic*

or *classic-modern* only tend to disturb the true course of modern design in this country. They have a decadent sophistication that is unpalatable to the average consumer." He sees the essence of true functionalism in American colonial furniture. We are to express something of the same character but in terms of our own times. The mark of the machine tool has supplanted that of the handicraft tool and the manual processes, but the unchanging values of honest construction and good proportions remain.

Wright is equally well known for his furniture lines and for his metalwares. As in the cases of Geddes and Dreyfuss, his early experience of the arts was in connection with the theater. From brilliant and promiseful work in theater-design laboratories and theater production, he merged gradually, by way of manufacturing stage properties in a studio laboratory of his own, into making custom furniture and decorative metal accessories. Because of the success and reputation of designs for which he was his own manufacturer, in national markets, he began to be called on to design for industry. His "American Modern" furniture is extensively marketed throughout the country. He has originated scores of service accessories, particularly of spun aluminum. He believes that much of the characteristic decorative effect of modern rooms arises from the gleam of simple informal service pieces such as chafing dishes, trays, decanters, and cocktail shakers—where a decade ago it would have been a matter of vases and shells and statuettes.

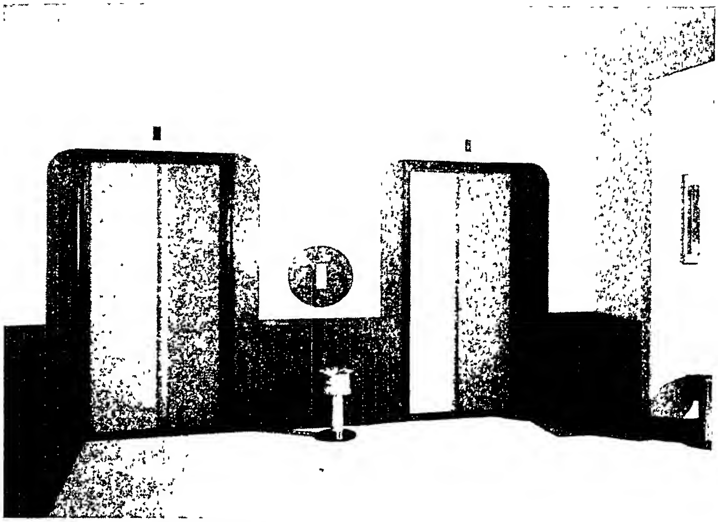
Robert Heller, of New York, was for a time particularly concerned with interior architecture. In that period he designed outstanding apartments for several people prominent in New York theater circles; and he is responsible for the broadcasting rooms of two radio stations—typical modern problems—and for salesrooms. His later design work ranges through a wide field of electrical accessories, toasters and percolators, electric fans and air-conditioning equipment, and includes pianos and bicycles.

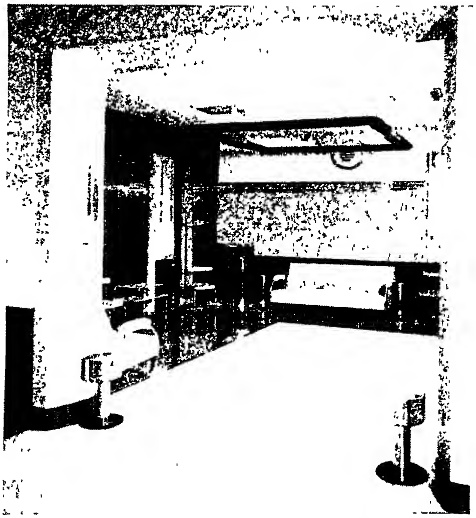
It is primarily the architectural conception of the whole that distin-

guishes the products of Deskey and the men and women working similarly as interior designers. The essential principles of their design work are identical with those of the architect. Unity and structural integrity are basic. The use of new industrial materials, or the new use of old, familiar materials, enters as an important determining factor in every undertaking. In interior architecture there is, of course, a special significance in qualities of surface capitalized in terms of texture and color. The final, the most distinctively machine-age element is electric light, used as the harmonizing and unifying element, now a marvelous flexible instrument in the hands of the designer. These are the emphasized Modern means: distinctive totality of impression, truth to structure and materials, creative manipulation of texture and color, functional and aesthetic lighting.

Unity is first. It is based upon the Modernist's conception of organic architecture. It means that the architect's truth of building becomes in turn the truth of the interior designer's scheme. The interior is accepted as a flexible space composition. Within it the prime accents are three-dimensional units, built in or movable, but always organized into a close, dynamic relationship. Because of the now almost universal trend toward horizontality in building design, the interior composition becomes in turn a study in horizontals.

It is here more than anywhere else that the new figure works as industrial designer, keeping the whole use problem in full view, remembering mechanism as the basis, and guarding above all else the synthesis. Gilbert Rohde has provided examples in rooms where a basic harmony is established through use of a simple set of rectangular forms repeated throughout the major furnishings and made to echo the builder's elementary structural lines. He was one of the first to insist upon the height lines of the several units of furniture as affording a key to the new horizontal planning. Russel Wright further emphasizes the effect in prefabricated, unit-constructed furniture to





Two views of the WCAU Broadcasting Studios, Philadelphia, Pennsylvania.
Robert Heller, designer.

be used in variable combinations. One of his divans, for instance, readily becomes three chairs or a short seat and a chair. Unity is furthered also in the increasing use of built-in pieces, where in the past separately designed items were added.

Because we have the industrial-design approach, the new architectural conception, we have also the new sense of functionalism and structural integrity in the individual pieces of furniture. Each material adopted yields its own peculiar set of values. Not surprisingly, wood remains first in the list. Kem Weber provides what might be called the new aesthetic of wood use. He points out that a great deal of so-called modern furniture is merely the old cabinet-makers' furniture with a new surfacing. "That a surface is plain or without ornamentation does not necessarily mean that the object is modern in the true machine-age sense. It is only when the effect grows out of the designer's consideration for the machine tooling that one can logically claim a place for the product in the machine-age complex."

Kem Weber first encountered the problem of mass-production furniture design when he was employed to assemble systems of display rooms for large dealers back in the early days of Modern design. He found, as has happened in the experience of many others, that there was no adequate mass-production furniture of sound proportion, simple finish, and structural integrity. He became one of the pioneers in experiment with bent and laminated wood. The proportionings of his now widely known chairs are based upon the natural curves of the human body, but the structural features have been determined especially by the demands of simplified machine construction.

Next to wood, metal is most familiar in the modern interior. The metal chair is now encountered in every kind of interior from penthouse to chain cafeteria, from intercity bus to country church. The estate to which it has been reduced may be responsible for prejudice which is now delaying more

rational, and more aesthetic, metal use. A few creative designers, however, have taken this cheap and practical product and have capitalized it in terms of its own special expressiveness. It is possible occasionally to go into a room fitted predominantly with furniture made of chromium-surfaced stock piping, and to experience there a sense of rightness and harmony as great as that detected in some seventeenth-century English household where unpolished hardwood and fine handicraft workmanship were the elements. Lescaze and Wolfgang Hoffmann, Kiesler and Neutra, too, know how to create such unified interiors and to put in them desks, tables, and chairs marked with individual distinction.

The beds that Geddes created for a manufacturer, using discarded railroad rails, and endowing with a formal value almost sculpturesque; the blinds and shades of aluminum designed to resist heat and cold as well as to enhance the appearance of the interior: these are but two instances of metal uses which are as various, sometimes as surprising, as are the uses modern designers make of glass.

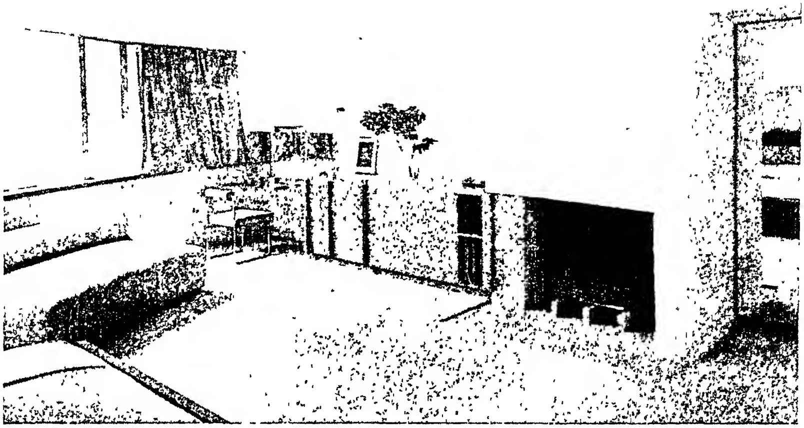
Glass has to even a greater extent its own sort of distinction, which can be capitalized in actual furniture design, in all-glass pieces or in combination with chromium, stainless steel, and other metals. Its peculiar effectiveness is glimpsed especially in modern interiors by Lescaze, Rohde, and Wright. One recalls too Deskey's triple-deck coffee tables, or Kiesler's table unit of metal and glass devised to act as the keynote for design of the major furniture of a room. Walter Dorwin Teague designed a large table with a heavy cylinder of clear glass as pedestal, a glass block for base, and a sheet of glass for the top. In it there is kinship with the furniture and interiors of a hundred years hence as forecast, according to the prophetic visualizations of H. G. Wells and the masters of Hollywood, in the film, *Things to Come.*

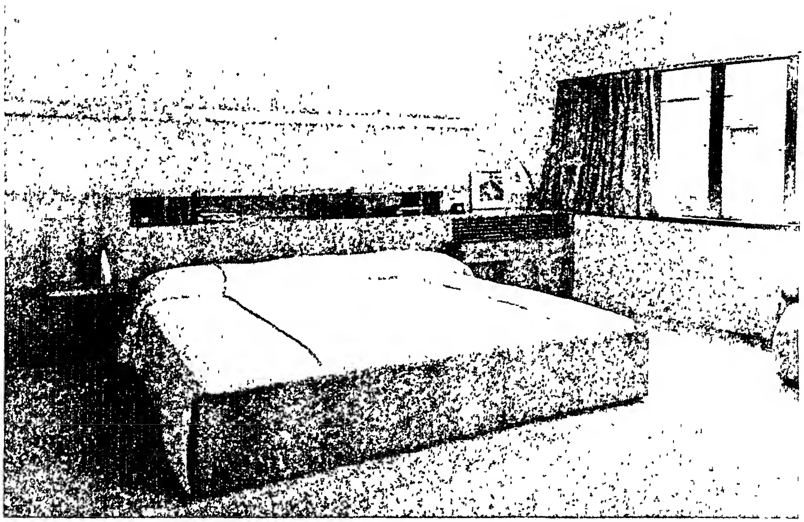
One of the greatest charms of glass in the interior is the gleam and glint which result from the characteristic texture. All materials—wood, glass,

metal, also textiles and painted surfaces—have their own inherent modern texture values, just as they have their own color values. They are used, and with them a secondary range of interior materials including cork, plastics, and leather, for the fullest capitalization of grain, vibration, glint, and glow. In the rooms of Heller, Rohde, Wiener, Wright, texture often does the work formerly done by applied pattern.

The matter of texture is of exceptional concern to the modern who followed on those studies initiated by Picasso, Archipenko, and the Neo-plasticists. Every possible material has been subjected to experiment with regard to tactile and visual potentialities. As a result a richness and a subtlety are being achieved in today's interiors beyond any conceived before. The gleam of a glass and nickel table, the grain of a cork wall panel or of an all-leather-covered desk, is made to contribute importantly as an aesthetic element in the room. It is treated not merely as an isolated effect or point of interest in the old way, but as contributory to a complex, all-pervasive pattern, in which every textured area is played against all others much in the manner of instruments in an orchestration.

It is here that the true inheritor of abstract art is finding some of his most potent means and realizing some of his most original effects, in achievements that are comparable with the plastic creations of Mondrian and Jean Hélion. He uses equally few low-toned textures, with equally delicate calculations of the complete compositional effect. When one has become acclimated to the atmosphere of his interiors, one begins to be uneasy among the heavy woodcarvings, richly brocaded hangings, Nottingham lace curtains, and thick Oriental carpetings of homes in the lingering tradition of the Grant and McKinley eras. The discomfort he experiences is akin to that which the lover of abstract art feels in the museum galleries with their explicit Courbet nudes, forced Sargentesque portraits, and lush mermaid-filled landscapes of Böcklin.



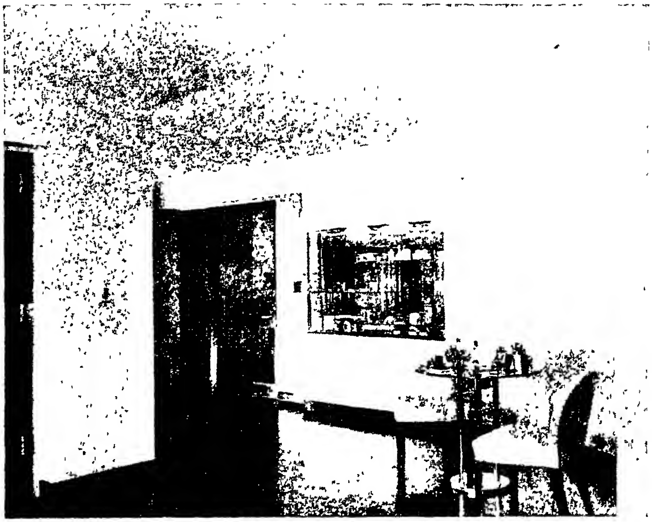


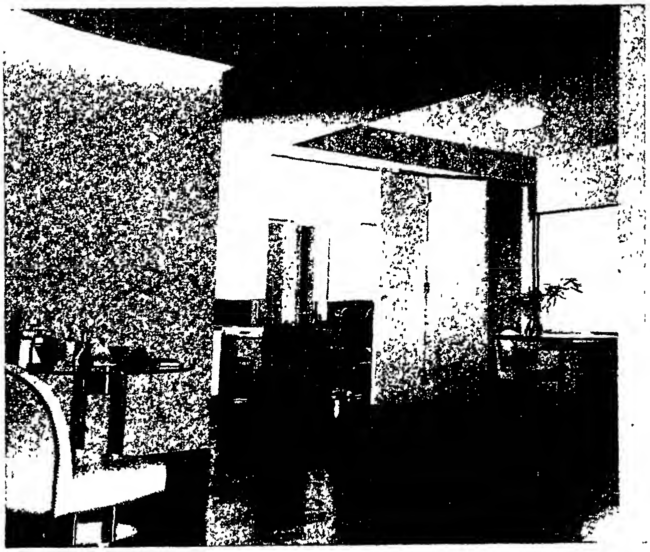
Bedroom in the Kramer House, New York City. William Lescaze, architect.

If texture in the modern sense has been capitalized only limitedly—but in the hands of a few leaders creatively and with a new perceptiveness—modern color is still actually widely misconceived. It is likely to be visualized as the spreading about of Chinese reds and Paris green, or the juxtaposition of broad areas of black and white. Nevertheless a few sensitive architects have developed entirely new standards of subtle coloring and of color-and-texture harmony. In pigments and natural woods and other materials they find native textural and color values, either new or long covered under stains, varnishes, and the dull range of Victorian paints. Where in the nineteenth century the decorator could not bear to leave even a small wall space unadorned, the Modern designer protects the sheer wall against encroachment, and proceeds to make it rich in effect with this hidden resource of texture-and-color orchestration. Color particularly is a humanizing element, liquidating somewhat the rigidity and coldness of modern structure.

By no means all the designers who have contributed to the advance of the new architecture are masters of the nuances of color composition. In the work of Wiener, Lescaze, and Deskey representative examples of harmonious schemes are to be seen. But it is perhaps in the creations of Eleanor LeMaire that the new principles are best illustrated. She uses color as subtly and constructively as does a painter.

Miss LeMaire came to the work of industrial design with preparation out of academic education and art training of the usual sort, and after several years of study at architectural schools (the effect of the latter tempered fortunately by influence out of constant association with engineers). Like so many designers in the industrial field she was drawn into special study of Modern painting and sculpture. Not so unrelated as it may seem was an excursion into the realm of Chinese costumes, with resulting conclusions about Oriental use of colors—always amazing to those who know the "rules" of Western painting. Those conclusions, with experiments in the chemistry of pigments





Beauty Clinic designed for *Good Housekeeping Magazine* by Eleanor LeMaire.

and in color psychology, provided the broad foundation for her practice in interior design.

Miss LeMaire explains that the client who insists upon a fuchsia-colored room doesn't really want a room with fuchsia-colored walls or hangings or furniture, but only a harmony of other colors, with perhaps rare touches of the coveted hue, which afford the *apparent* effect of the flower. The process is as subtle as that by which a modern painter may seem to flood a picture with the sense of sunlight or woodland shade or clear cold dawn without any of the obvious colors. There are of course the usual studies of key, rhythm, harmony, and particularly there is a new reliance upon the movement values of certain colors—within the restful whole.

Just as successful orchestration of the plastic elements in painting depends upon a knowledge of the recessive or projective properties of the several hues, the yellow-red range tending to push volumes forward toward the eye, the blue-violet range making them recede, the interior wall coloring is now arranged for the desired degree of retiring effect or forwardness. Particularly in the newer rooms, in which one or two walls are painted in a color different from the others, color "weight" is a fundamental consideration.

As Miss LeMaire expresses it: "Color is something quite capable of taking form—dimensional form, and depth. To the modern designer paint is almost a structural medium. With it we 'fortify' or complement the existing architectural background, bringing some walls or lines forward by accenting them, or making others recede by wiping them out with neutral tones. So, we lift ceilings or bring them into better living relationship with the walls and floors of a room, and the use to which it is likely to be put. Paint can do all of this.

"To design a room with color is to study the relative intensity of light as it reaches the walls, and then to determine whether it is in the best interest of that room to bring forward a wall by projecting it more intensely into the

light or letting it fall back into its shadows. . . . Good color to the modern designer is always fresh, even though it may be what we call a receding neutral color."

If one does not know how Matisse "brings up" certain portions of his paintings with rich reds (a service performed equally by insertion of heavy patterning) or pushes back a too-obtrusive volume by recessive colors, one can hardly measure the importance of this device in adjustment of the room ensemble. And indeed we have on all sides examples of professional misuse of color weights. Particularly in the two-colors-to-a-room vogue, picked up by a horde of decorators because it seems to be "the new thing," you will find walls in full light painted in such striking reds and yellows that they will all but knock you down, where they should have been "set back" with something out of the blue-violet range; and a poor bit of wall way in the background, that might well have been brought forward with the insistent range, is further retired by misapplication of blue-green or hazy gray.

In short, behind the low-valued simple colors of the new interior architects there is a complexity of knowledge that has been gained to mankind only with the machine age and the appearance of abstract art. Behind the harmonies of Miss LeMaire, of Lescaze, of Wiener, there lies a long train of investigation in which both physical science and aesthetics have been profoundly involved; to which the individual practitioner adds intuitional creation, the "feel" for rightness. Along the line of this development we may confidently look for one of the greatest surface changes in both exterior and interior architecture. Homes and furnishings will be brought to a degree of richness and to a shading of sensitive coloring undreamed of in the past. Here is one major answer to those who find the new architecture and industrial design too cold and bare.

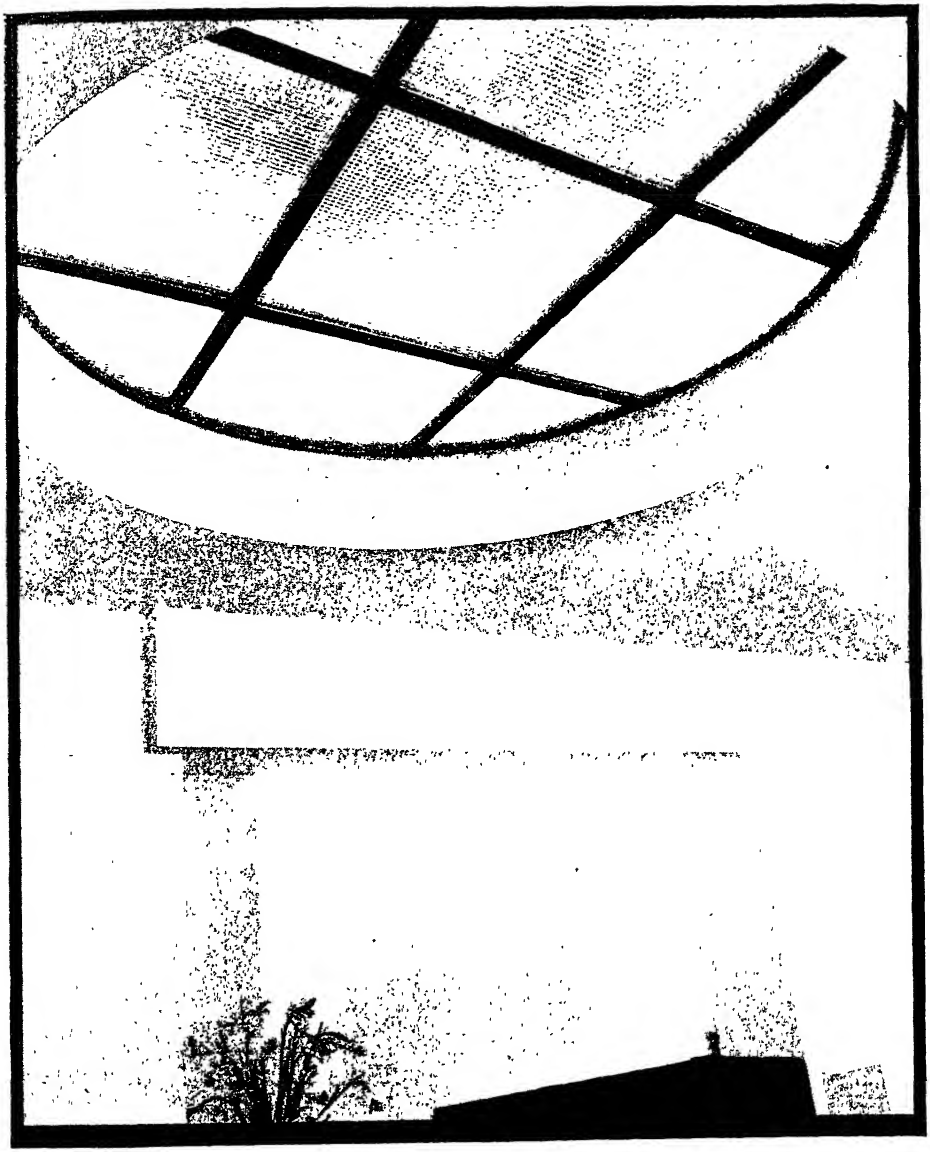
The other new resource is electric lighting. It is most typically of the machine age, dependent upon mechanisms marvelously efficient, precise,

and flexible. No design involving texture and color is ever rightly undertaken without reference to this third surface factor.

As a matter of fact, lighting is not a surface factor in the old sense. It no longer strikes things. It is, rather, permeatively and unobtrusively filling the space that is the first element of the new architecture. In an interior by Wiener or Lescaze lighting fixtures do not push into the room. They have all but disappeared. This serves to further, inside the house, that sense of sheer unbroken wall area which has been established in the exterior architecture. Lights in hidden recesses or behind glass ceiling areas, or in border troughs, are the original sources. Every wall or curtain or major furnishing unit is considered for reflection or diffusion values, with regard to color, texture, and placement. Even incidental fabrics, bedspreads and floors and floor coverings, are minutely studied in relation to light.

There is the room effect as a whole to be thus composed. Then the designer may go on to plan localized areas for special treatment, as Wiener has in pooling light over a sofa and chair area in one room, somewhat distinct from the neighboring bookcase-and-reading area and a near-by piano area. Examples of indirect illumination with emphasis on special features are seen in Wiener's hidden trough casting rays at night on a specially woven curtain covering the glass side of a room, whence the softest of light is reflected back; and in some of Lescaze's arrangements in which change of color in a two-tone room and change in structural form are accented (or modified) by the light from in-built reflectors.

The machinery for electric lighting has been refined upon and perfected to a degree far beyond that realized in most other fields of architectural accessories. The shadowless shaving mirror designed by George Sakier as a feature of his bathroom-cabinet unit, and the perpendicular line of light for a book-filled library wall section devised by William Muschenheim, were early isolated advances which have been followed up by designers creating

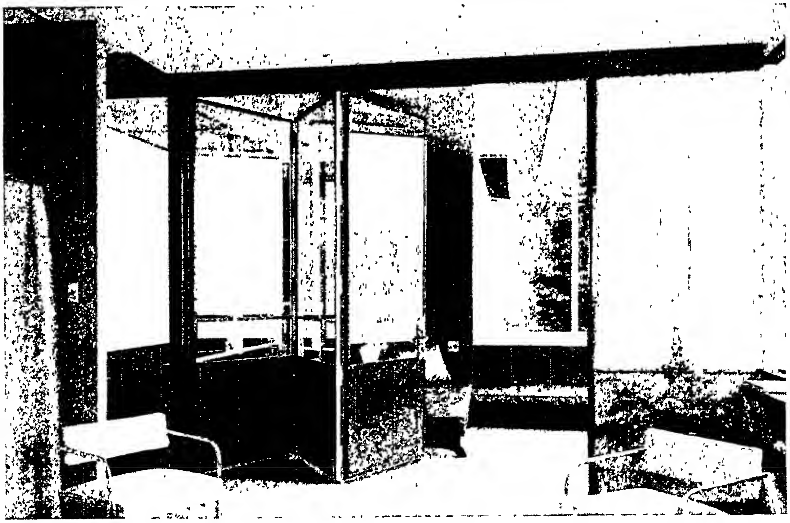


The architect as industrial designer utilizing means of the abstract artist. Indirect lighting units over couch in Lescaze house, New York City, New York. William Lescaze, architect.

a multiplicity of fittings for specialized purposes, and new forms of reflecting units and remote control. It early became unnecessary for the interior architect to do anything further in this direction except for the purposes of some unique effect. Yet few of the interior architects have failed to design portable floor lamps or special lighting units for desk or kitchen sink, some of which have gone into mass production.

The use of mobile light played upon expanses of wall space, and the adoption of light and color schemes based upon study of psychological factors, have perhaps failed to make the progress anticipated by some of the artists after their early experiments. Wiener designed a consultation office and used all the scientific means at his disposal to create in it an atmosphere calculated to calm and relax the patients of a mental hygienist. Deskey built an instrument to project moving patterns of color upon a white wall. But these remain exceptional thrusts. The true wonder of modern architectural lighting is in the subtlety possible in the complete room effect, and in the great range of variations that can be played out of invisible mechanisms within the larger harmony.

In lighting machinery and effect, of course, the interior designers are largely adapting the electrical equipment originally devised by artists of the theater, for use in connection with the new stagecraft. There is not a little of the honesty and the beauty of modern stage settings in the new interior architecture, and one recalls that several of the outstanding industrial designers and interior designers have been occasionally identified with stage work, if they did not originally come from the theater. Geddes, Dreyfuss, and Kiesler regularly designed productions, as did Joseph Urban; and Heller and Russell Wright have worked in the creation of scenic designs. There are those who would say that stage design is one more branch of the profession we are broadly terming industrial design, removed by its nature from the mass-production category, but no less utilizing new machines and new materials



Interior of a house at Altadena, California. Among the new features are a disappearing glass wall, aluminum fireplace, and walls of cellular copper-bearing steel—within the usual "space composition". Richard J. Neutra, architect; Gregory Ain, collaborator.

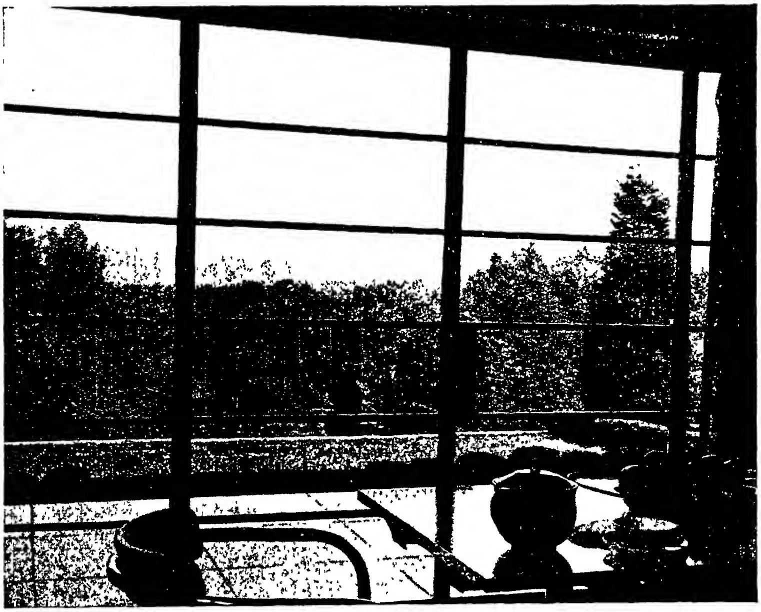
for aesthetic effect. It has been often remarked that light and color on the modern stage go far toward replacing the old-time depicted scene, an advance toward abstract and mechanical means of design.

Having reviewed thus, roughly, some of the principles underlying the new interior architecture, and the individual materials and means employed, we might pause to ask "What will the future bring out of this complex of new elements? Which new asset will contribute most of change and new beauty?"

Of the intangibles, light and color are certain to work wonders of which we have only glimpsed a slightest beginning. Of the materials, wood is surest to lose ground, though in its new forms, as plywood or laminated slab, it enters daily into unaccustomed uses. The new metals, certain types of aluminum and specially treated steels, afford exciting possibilities, both in architectural structure and in furnishings. Plastics, too, will be developed for wall covering, furniture design, even flooring. But of all the materials, glass most spectacularly promises new thrills, most captures the imagination.

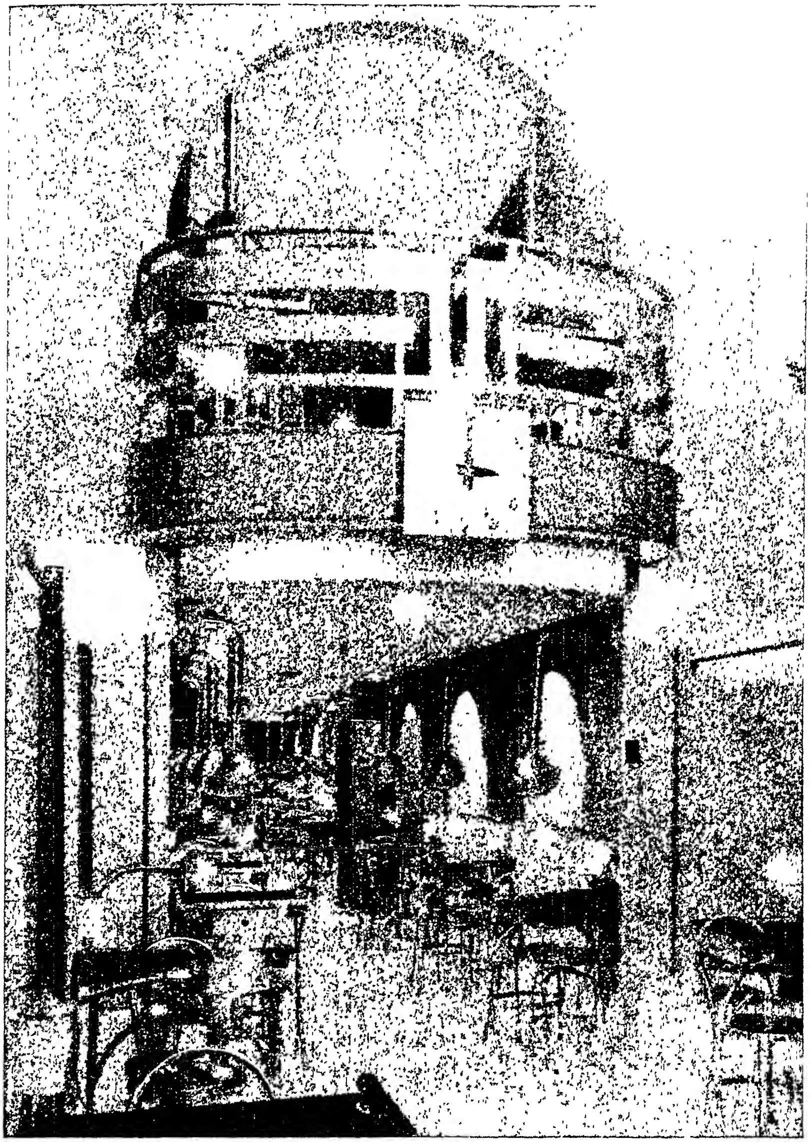
Dependent now only upon further technological research, it promises to come to us unbreakable in a hundred new guises, for building construction, for shaping in the studio. Its color possibilities are unlimited. Its texture is incomparably bright and flashing, with a jewel-like sparkle and glint. It is both sanitary and ornamental.

The next era may well be called the Age of Glass. Glass is the building material par excellence for a complete, organic twentieth-century environment. We can visualize it as providing walls of light, enclosing the living space at will, shutting out the elements when they are hostile but not the cherished view. Richard Neutra speaks of wedding indoors and out and devises interior walls of folding clear-glass panels. Mies van der Rohe in Germany used sliding glass partitions having all the advantages of the Japanese wooden or paper ones and the added virtue of transparency when wanted, and these the world will doubtless adopt for special use. Such parti-



The modern idioms used in wedding indoors and outdoors. Contempora House, New City, New York.
Paul L. Wiener, architect.

Entry of the McGraw-Hill Building, New York City, New York; an incidental abstract composition. Raymond Hood, Godley and Fouilhoux, architects.



Lantieri Beauty Shop, New York City, suggesting the glint of glass as a new aesthetic value in architecture. A redesign project by Vahan Hagopian, architect. *(Photograph by Palmer Shannon.)*

tions, curtained and easily adjustable, provide the means of that space adaptation which is an ideal of the Functionalist architects. Mirror glass still has its right uses for space enlargement (rather than for the multiplication of "rich and exotic details" that was overvalued in the twenties). And opaque glass in color for certain interior walls gives promise of a use as wide as that of construction glass for exteriors. The Germans a decade ago had shown us models we have not yet taken advantage of in an interior architecture of clear glass. In great public establishments as in little shops we confidently anticipate new revelations—in glass.

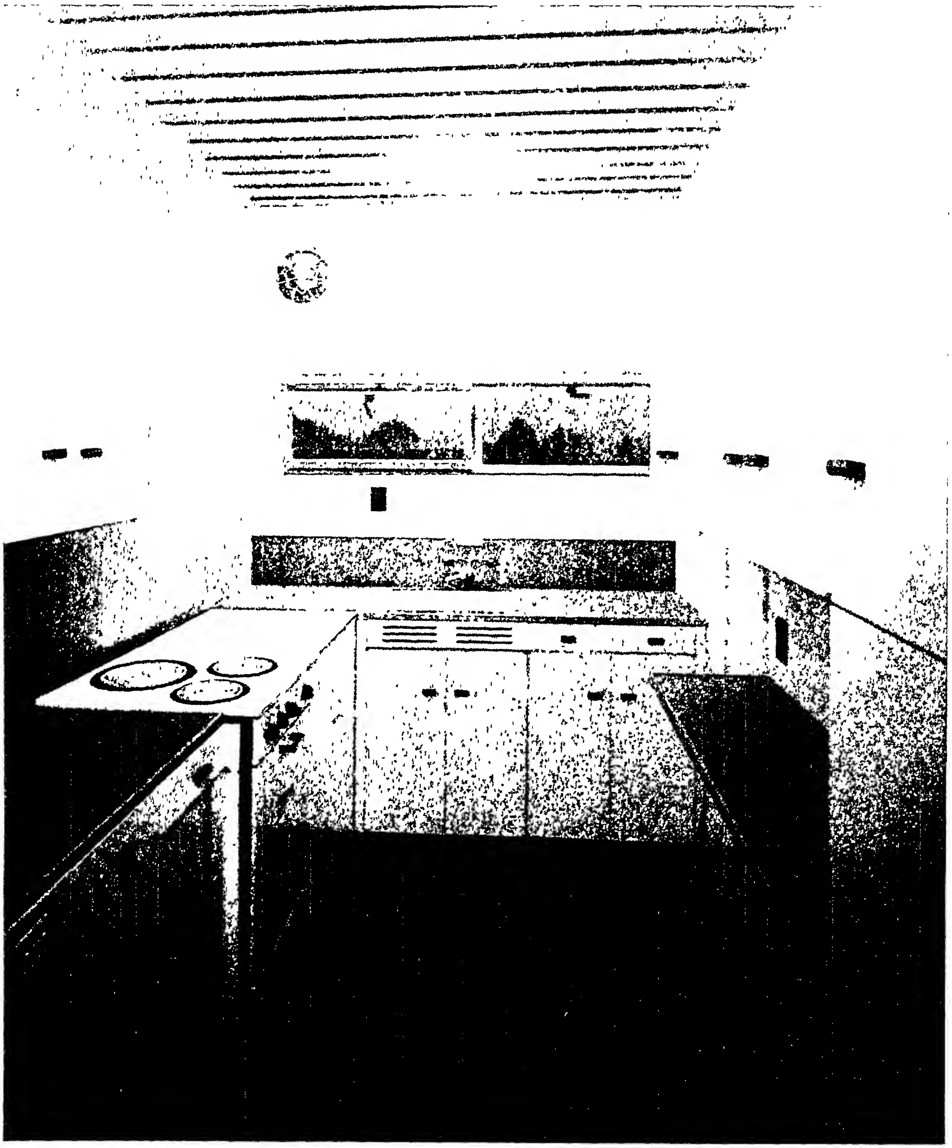
Already our factories are turning out a dozen types of glass vacuum bricks for wall construction (after our architects had imported sample shipments from Germany, Holland, and Czechoslovakia); and we may be sure they will not be far behind with a full range of interior wall panels and partition sheets. All this, moreover, relates to the architectural shell. Within it the greater change will come, in glass furniture. Already there is a semi-flexible glass so tough that a motor truck passing over it will neither shatter nor break it. Waiting only upon some further improvements in methods of working it to pattern, it is ready to the designer's order as an incomparable material for a hundred furnishing uses.

If there is here a certain portion of speculation, a prophecy of transformation not fully foreshadowed in any already existing home, one might remind the reader that in 1900 no housewife could have been led to believe that the kitchen of 1936 would be the gleaming, clinically clean, light, and attractive place it is in today's progressive homes. The small windows, the smoky walls, the varnished wooden icebox, the musty pantry shelves, the long distances from stove to work table to sink, the involved and dust-catching pipes and boiler and chandeliers: what hint did they hold of the compact, bright, efficient machine kitchen of today? Here, of course, because the room design actually began with a group of mechanisms, the sense of

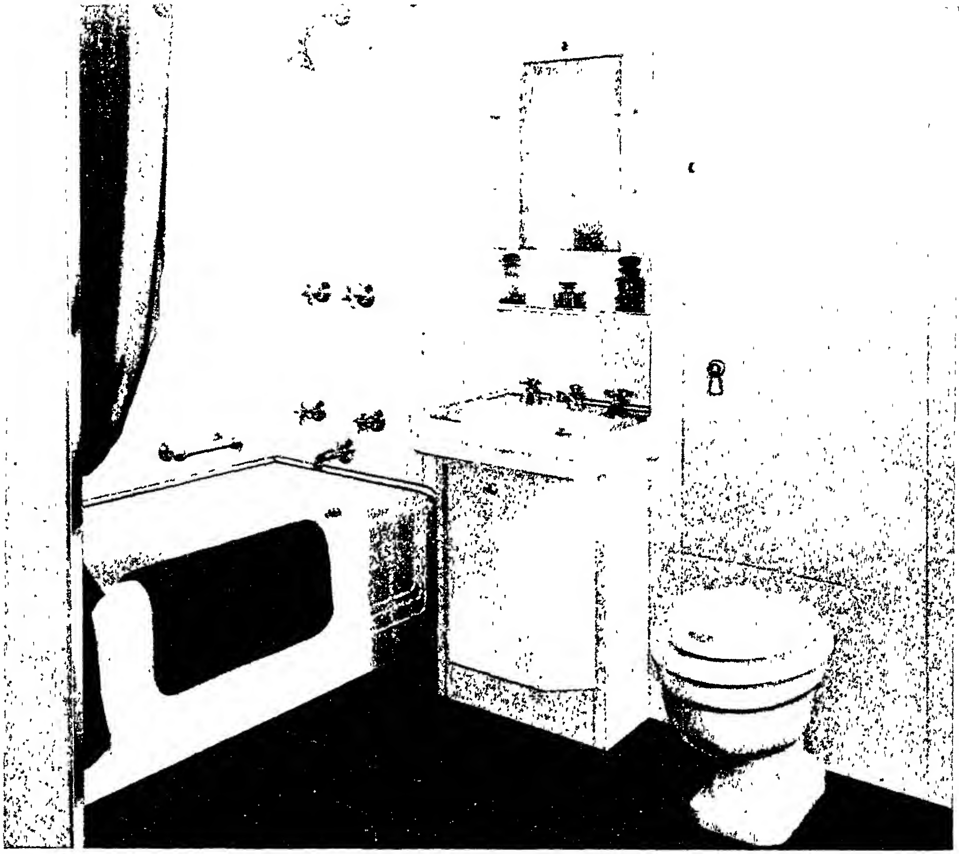
industrial design first came into home architecture. Here still some of the most typical interior ensembles, and the most attractive, are to be found. To say that the kitchen in Contempora House or the Mandel house is a delight to the eye, is to express appreciation of a quality that grows characteristically out of machine-age inventiveness and the new feeling for abstract design.

The bathroom, too, is functionally honest, immaculately clean, joyously bright. It has claimed the attention of leading architectural and industrial designers. It is here that the inventor-artists have made their first large gains in marketing prefabricated units, comprising the whole room or a single major plumbing unit and its adjacent wall. It might be noted that in thus perfecting and standardizing the bathroom and the kitchen—not to say establishing their aesthetic—the Moderns have glorified first those parts of the home that used to be considered mere utility adjuncts not of any importance in the artistic architect's work. The basement, and particularly the furnace room (soon to be generally known as the weather room) is next in line for revolutionary development. Already many waste spaces, formerly untidy, damp, and forbidding, have been salvaged for recreational use by reason of improved heating and air-conditioning mechanisms. Even heat pipes and air ducts have been used by a few designers as a new sort of abstract composition in the basement recreation room, yielding a pleasure akin to the aesthetic.

The same spirit that is inspiring the modern appearance of home furnace rooms and baths is also active as a transforming influence in the executive offices of great corporations: redesigning the visible mechanical elements, expressing functional purpose, reorganizing and emphasizing for visual unity and harmony. In their way some of the well-known directors' rooms and presidential suites are as bright and fresh and livable as modern home interiors. The oil paintings of past presidents, impressively gilt-framed, the oak paneling, and the marbled columns have disappeared along with the



Kitchen in apartment at Palm Springs, California, with equipment assembled from mass-production units. A. Lawrence Kocher and Albert Frey, architects.



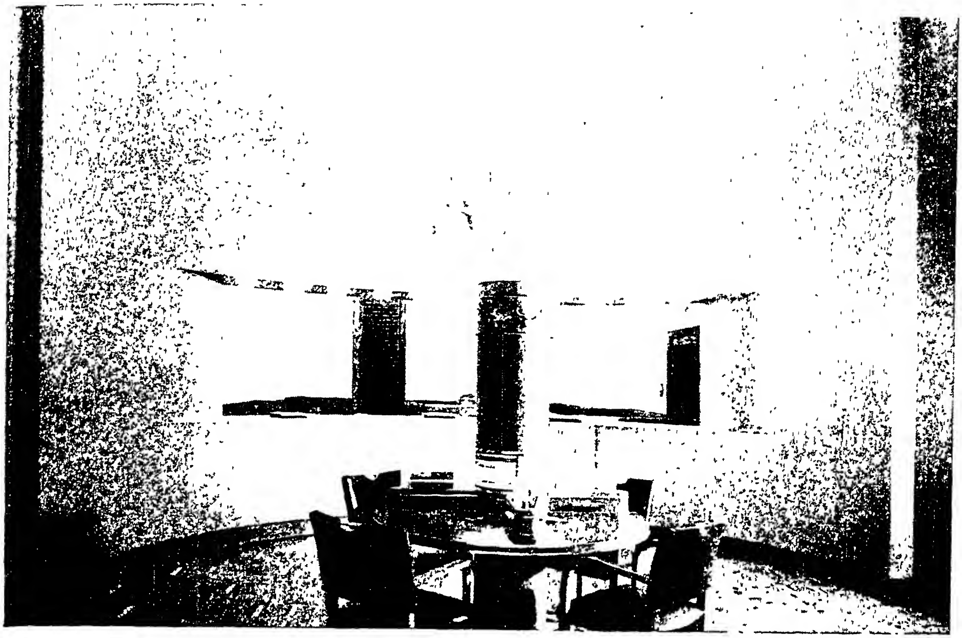
The bathroom, like the kitchen, is now machine-like, clinically clean, and industrial-designed. Here is shown an assemblage of three prefabricated units. Each major plumbing element is delivered with its wall section ready for installation in varied combinations. Designed by George Sakier for American Radiator and Standard Sanitary Corporation.

narrow windows, velvet curtains, and mahogany bookcases. Today all is sheer, clean, light, colorful—but still rich.

The richness here, of course, is occasionally aided by introduction of individual pieces from the handicraft studios. A hanging, a rug, a vase, may be used to set off or enhance the composition; or a weaver of patterned textiles may contribute an arresting spot of color. The extreme Functionalists deprecate such revivals of the arts and crafts. But having established that the unity comes out of truth to mechanism and use function, that the sheerness and cleanliness and horizontality are capable of dramatization with their own sort of distinction, the designer often is ready to admit that there are desirable values that are not yet to be found in the range of machine-made materials and commodities.

We, too, refuse to be dogmatic, or severe on the man who brings a distinctively individual handmade object into his ensemble. That the machine-age spirit of simplification and concentration has led the best handicraftsmen to return to an almost primitive simplicity, thus rendering their products the more appropriate to the machined environment, is one of the curious circumstances of the interplay of manual and mechanical influences. In any case one finds Wiener, Deskey, Miss LeMaire, and Hoffmann sparingly admitting special handmade pieces to their rooms; and some of the weavers, potters, and craftsmen in glass have built up their reputations and their businesses as purveyors of original and appropriate objects suitable for the purpose. Only a step removed are those sculptors who, like Archipenko, compose in abstract or near-abstract forms, capitalizing native material values, thus producing works of art that are perfectly in the spirit of the new interior architecture.

Interior architecture is the subdivision of the industrial-design field in which the earliest approach has been made to a working understanding between artist and manufacturer. In furniture production particularly, a con-



Design for standardized Western Union Telegraph office by Henry Dreyfuss.

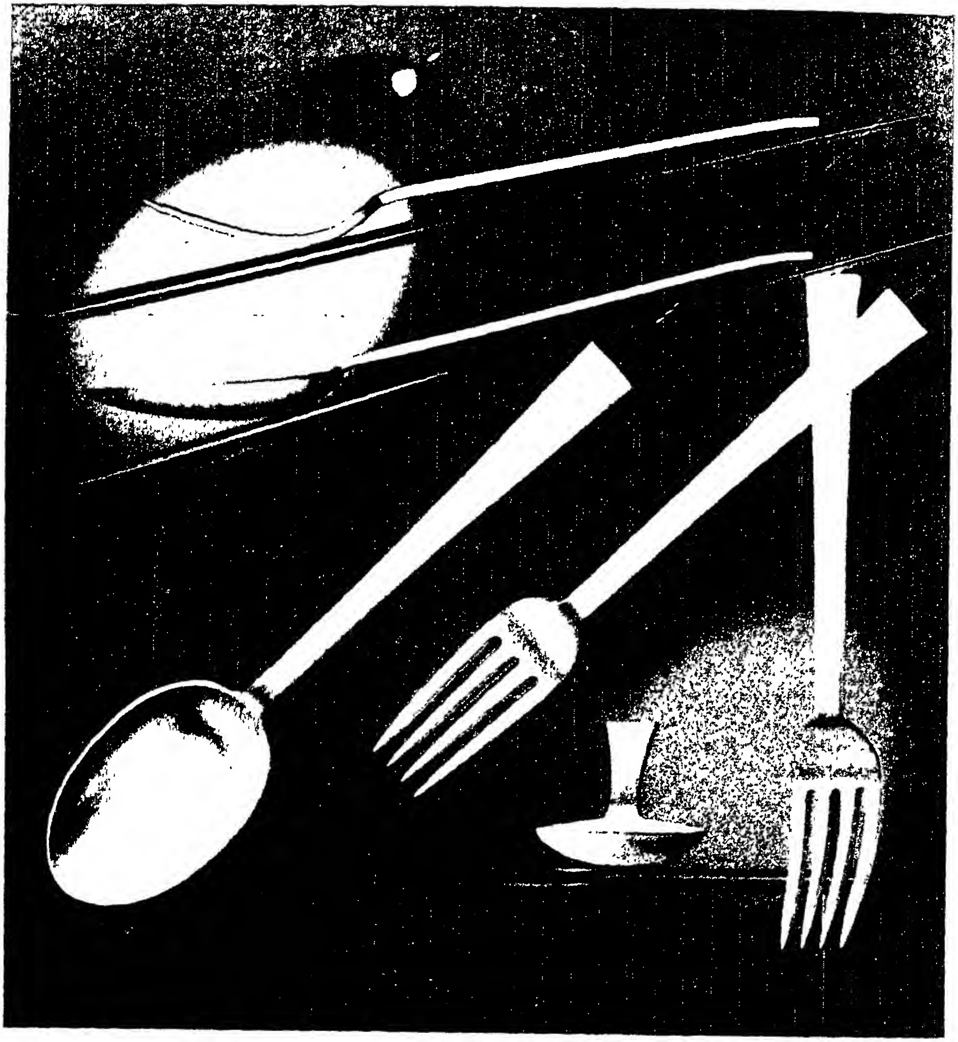
siderable number of designers and industrialists came to the new conception about the same time. The oldest of industries historically concerned with appearance value welcomed first the new generation of artists.

The working relationship and the entente between artist and industry are furthered here by association in what might be termed a laboratory and testing system. Almost all the men and women mentioned, and the entire group of which they are fairly typical, create architectural interiors for exhibition and display purposes, ordinarily creating each object and piece of equipment down to the smallest. These are seen at regional or national expositions, or as displays of temporary or permanent character in large merchandising centers. They may have been assembled specifically to demonstrate the use of some new material, or to show some one line of electrical equipment and appliances, or to exhibit the inherent charm of some prefabricated home's interiors. They may represent some more broadly educational purpose, as when they are incorporated into model housing schemes by a governmental body working to raise the level of home and neighborhood planning. Several of the interior designers have collaborated in the models used by the federal housing authorities in visualizing workable minimum standards both in the Public Works projects and for building and improvements carried out through public home loans.

It is almost impossible to estimate the extent of influence being wielded in these ways. The effect is dual: there is the broad, permeative educational influence upon the public, and the accompanying slow process by which standards of production are raised and artist-designed furnishings made more widely available. The artists named are being regularly commissioned to provide mass-production designs incorporating the same essential qualities as the exhibition work, or to solve new problems. This cycle in which producer and artist jointly profit by the expedient of "shows" at which public reaction is measured (and orders taken) is likely to have a counterpart

in associations of manufacturers and designers in the entire industrial field, cooperating in demonstrations and in tests of consumer response. Meanwhile this one field of interior furnishings has its own practical, highly useful experimental laboratory and showground.

The most striking early achievements of the industrial designers have been in the fields least influenced by design precedent. The most obvious style mark, the streamline, came from the one wholly ancestorless invention, the airplane. Most rapid progress has occurred in connection with those commodities that are either substantially new things in the world or else so essentially utilitarian that they had escaped artistic treatment before, the electric appliances, furnaces, and cigarette lighters. Interior design is at the opposite pole from these mechanisms and inventions. It is a realm strewn with precedents, period styles, Victorian traditions, and countless decorators. That the little band of industrial designers has been enabled to bring interior architecture identifiably into line with Functionalist architecture, automobile design, and mechanically timed domestic appliances is in itself a remarkable achievement. That the same characteristic machine-age impress, the essential formal distinction, should spread over from practical engine to environmental ensemble is sign that industrial design is vital, permeative, and fundamental to modern living.



Metalwares begin to be stripped of all ornamentation. Silverware manufactured by International Silver Company. Frederick William Stark, designer.

10. ALL THINGS RECONSIDERED

NOTHING is too small or too obscure to be redesigned and made expressive of the new ideal of form. Each article or object, sheer, gleaming, colorful in its own way, according to the extent to which it fulfills the creative design requirements, falls into harmonious relationship with all else, becomes integral to the intangible, pervasive twentieth-century atmosphere. Furnishings and appliances for the home, the office, the factory; objects of intimate personal use and those set out for public service alike participate.

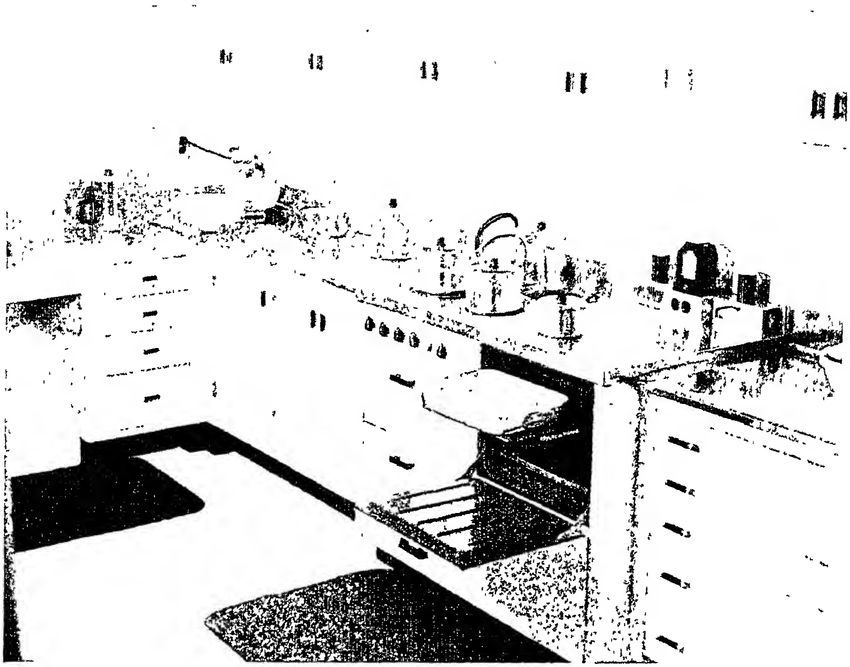
There was an axiom familiar in the nineteenth century: "what is fit is fair; what is fair is fit." One of Victor Hugo's characters makes use of it. Ruskin, Arnold, and others repeated it variously as a part of a transcendental philosophy, abstract and remote from everyday life in industrialized towns and cities. It no more held out promise of transforming that life than did the strange visual abstractions which presently began to appear as a part of the revolt of the artists. Today, however, we can trace the process by which the one as the other is made the essence of an actual, tangible three-dimensional aesthetic expression.

Present-day industry recognizes the practical application of the maxim. A New England steel manufacturer, John W. Higgins, makes the comment: "Manufacturers must be realists and must give their first attention to techniques, mechanics, and functional engineering, but their machines should express a correlation between efficiency of function and harmony of proportion that is deeper than surface beauty. Inventors and engineers keep on improving and perfecting machines and machine products and the day will come when every home will be filled with mass-produced masterpieces which will contribute to a higher level of culture and happiness." He adds that the reason manufacturers do not now make all their quantity products beautiful

works of art is because the public does not demand them rather than because they cannot be made.

Another figure of New England industry, E. G. Plowman, several years ago in addressing members of the American Management Association, voiced something of the same faith in the new spirit at work in machine centers when he said that generations to come will sift out the mass of industrial products of today for their museums. Certainly anyone sufficiently interested to study industrial-design essentials should be able to assemble as a result of explorations in the wilderness of American ten-cent-store aisles and notion counters, a unique little museum and study collection illustrating the thesis that use and beauty now march together. He might start with the cross-blade chopper out of Henry Dreyfuss' kitchen set, or some little glasses of Sakier's designing, and add a color pattern composition arranged with units that are Van Doren's spice shakers. There are small bean pots, bottle stoppers, garden trowels, paring devices that would belong, and occasionally a piece of tableware pottery. Rightly designed products in all these fields, and throughout the realm of objects and devices for everyday uses, are increasingly flowing into the markets.

Some industries are even consciously initiating advances scientifically programmed according to the forecasts of that other pioneer figure (to be described in the next chapter), the consumer engineer. It is in the furtherance of such advances that Lurelle Guild is restudying the basic forms of pots and pans, outboard-motor propellers, and all manner of products for aluminum use; and that Teague has been engaged by the Westinghouse people to work on X-ray equipment, and by camera and optical goods companies. One of the largest merchandisers in the world, a leading mail-order house, embarked in 1935 upon a program of industrial redesign affecting 85 per cent of all the three-dimensional products it handles. The program is to be realized as rapidly as the design department can arrive at standards for each product.

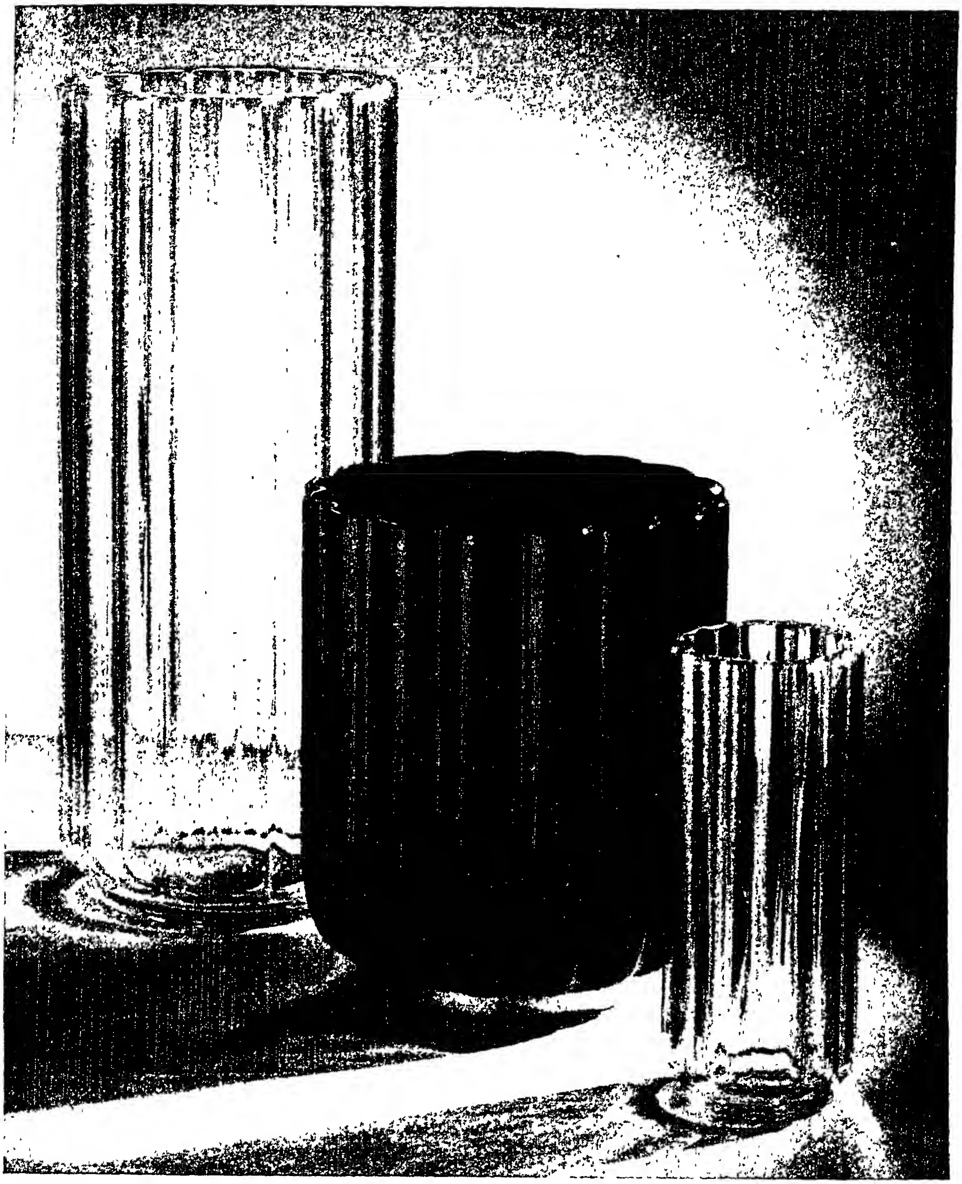


A kitchen unit-designed, as arranged for demonstration by the Mirro Aluminum Company.

Even so, we may be said to be only at the beginning of the transition period, able to see the transformation at only comparatively few points. Actual design accomplishments are not to be vividly experienced in every casual afternoon's shopping; nor is the character of the new art to be judged by home interiors in the average town. But even the thrill now produced by the advanced home or office—or the automobile salon or electric exposition—is, again, merely a hint of that promised by later advance. What industry foresees out of use of the new metal alloys, and what the artist already fixes in "visualizations," foreshadow a world magical and glorious as compared with the current rather homely Modernism.

This is equally true in the field of glass, and of the new plastics with their rainbow play of colors, to mention but a few new materials which science has provided through chemists, metallurgists, and technologists. Electrophysics in combination with these has brought its own world of new wizardries which may at any time come into the humblest home, as the hot-water supply and the radio set came in other decades. Further slight technological advance, together with recognition of the good type form, the new use-and-beauty standard: without question, upon that alone waits the operation of the law of mass production.

Almost any one of the objects illustrated in this chapter might be taken singly and made to exemplify the yet-to-be-fully-felt appearance design and mass-production possibilities. There is the metal-tubing chair, for instance. It is a piece of furniture used by the foremost interior architects and designers in almost every uniquely created interior ensemble to be seen today, and it is also available as a separately marketed creation, representing the work of at least a dozen of the men mentioned in previous chapters. So typical is it that examples by two Europeans who are now considered among the foremost modern architect-designers of the world were displayed at the New York Museum of Modern Art in the spring of 1936, in the international



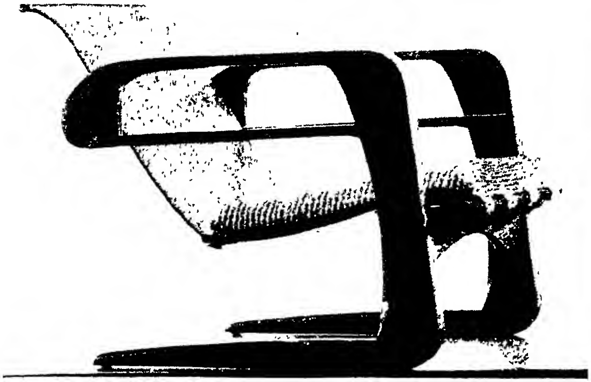
Mass-production glassware, designed by George Sakier for the Fostoria Company.

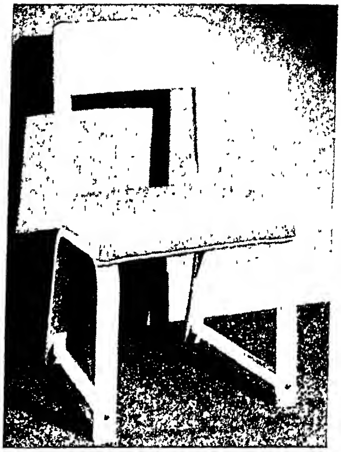
exposition of Cubism and Abstract Art (and examples of their influence upon design).

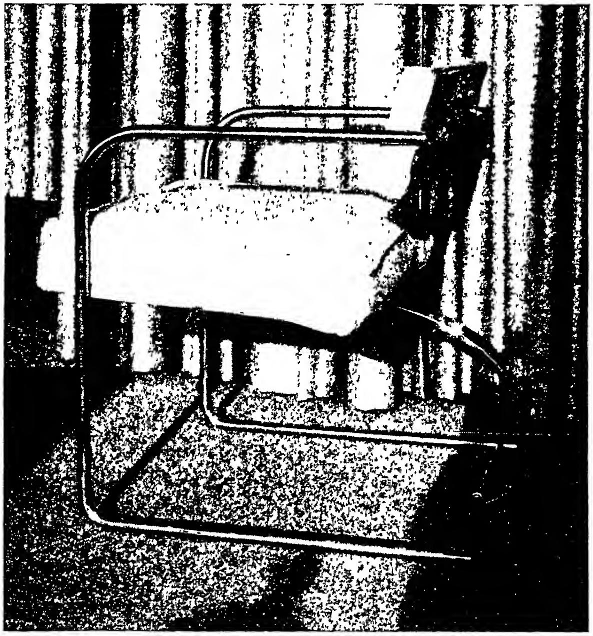
Here is a new use of one of industry's cheapest and most familiar stock products. The piping is available in any length, and many standard gauges. As early as 1914, Marcel Breuer made first use of this material in chair design. He did so in connection with the far-reaching experiments from Picasso to the Bauhaus, experiments which were eventually carried to the extreme of rubbish heaps being solemnly searched for construction materials that might yield tradition-free industrial-design type forms. One of the new rapid advances in metallurgy afforded exquisite surface effect for the tubing: the same silvery gleam we see on so many recently constructed skyscrapers and the same, it so happens, as was in the lining of cannon barrels used by the Germans during the World War, because of its noncorrosive, temperature-resistant qualities in combination with great durability.

Today's metal-tubing chair as produced by one of the most distinguished designers, Loewy, Deskey, Rohde, Lescaze, is potentially a perfect industrial-design type, because of its low cost, suitability for machine multiplication, and susceptibility to artist manipulation. In terms of mass-production possibilities it represents a few feet of cheap piping, mass-fabricated and finished with a bath of one of the superb new metal alloys, completed by a simple manufacturing process with the use of one or two other inexpensive materials. All that makes it different from the mediocre baby carriages, the trolley-car seats, the camp cot, and the thousand and one other objects where the material is used, is that initially an artist devised its form, appropriately related it to the human anatomical contours, and made expressive in the artist's way its universal chair function.

There are mechanical contrivances which, like the artist-designed chair, might be put into mass production at any time, conceivably to the extent that routine physical life would progress by the pressing of buttons and the







The chair problem reconsidered. Three designs in which materials and machine methods have been restudied and made the basis of new appearance. Above, left, chair in laminated woods by Kem Weber; above, right, bent-wood chair by Gilbert Rohde for Kroehler Manufacturing Company; below, metal-tubing chair by Richard Neutra.

throwing of switches, and thus human energy be conserved for more worthy ends. Already a thousand mechanical servants are ready to respond to every man's daily commands.

The garage door may now swing open, and the outside lights turn themselves on, as the owner's car approaches, and the inside lights come on and the door close as the car passes in. The servantless home often already has a robot cook which does its work at the electric range by a system of advance timing, to the end that a variety of foods are cooked perfectly for serving at the appointed dinner hour though the housewife has been away for an afternoon of bridge or shopping. The pantry door (ancient symbol of the perversity of inanimate objects) need no longer swing violently into the servant approaching with a heavy tray. Instead, it may now slide noiselessly open as footsteps approach, and close itself again, as silently as does the garage door, using a ray of light rather than a wave of sound for the purpose. An electric eye serves in the pantry; a radio-transmitter mechanism in the owner's automobile gives the command to garage door and lights.

The fairy tale familiar in all languages, of the laden table invoked by a magic phrase, has its counterpart in this half-emergent world of modern wizardries, too. Interior designers, Deskey and Lescaze among them, variously contrive it. There is the dining table that slides out of the pantry, and into place in the living room, ready set for a meal; and there is the tea table that actually rises beside the hostess' chair at a signal. Movable walls, now familiarly used in partitioning living floor space to make it more flexible for the hourly varying uses of family life, make possible the easy and instantaneous closing off of the dining area when desirable.

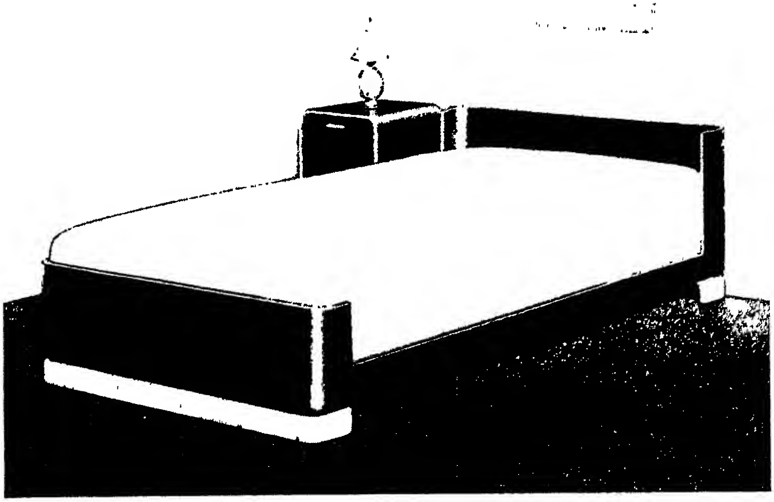
There are now small devices, auxiliary to the temperature-fixing equipment of any room, automatically holding the room's humidity to a degree comfortable for occupants and friendly to the long life of furniture. New mechanisms for the promotion of home safety include the flashing on of all

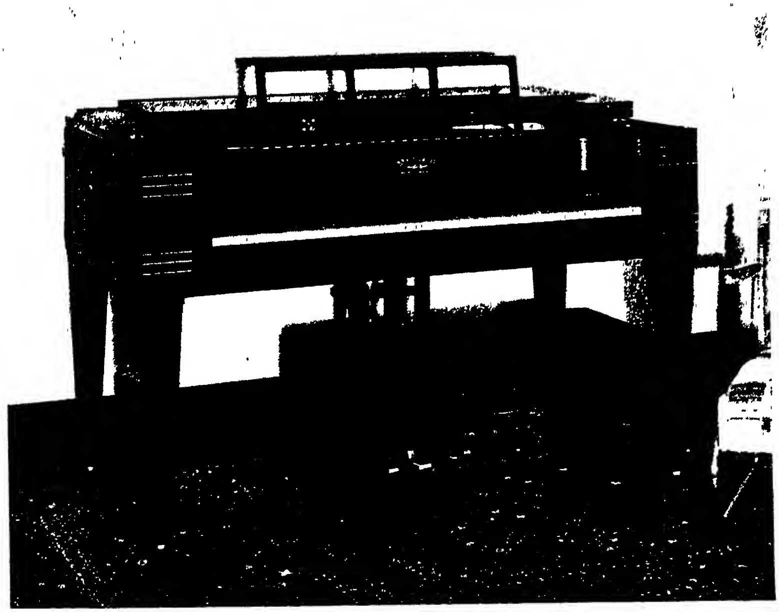
A basement redesigned to capitalize the cleanliness and beauty of modern heating equipment. Example in the home of Albert W. Haddock, Wilmington, Delaware, with General Electric oil-burning furnace.

lights and the sounding of a burglar alarm when entries are attempted at night. There is a device which turns off the flame of any gas refrigerator at the moment when a disturbance in its mechanism creates a danger. Further development along the line which first produced it is responsible for a mechanism that now opens the garage doors to their widest when the fumes of carbon-monoxide gas begin to saturate the atmosphere.

The daybook of every industrial designer contains lists of things yet to be undertaken in new invention and redesign for the improvement of the world's efficiency and appearance. The artist will gladly run through the lists with you upon invitation. Furnishings for the desks of the nation's executives are almost certain to be cited and compared none too favorably with the business machines in the outer offices. Clocks are mentioned as having been widely "modernized" to the end that they often are doubly ugly. On the streets, postboxes, fire signal boxes and fire hydrants, subway kiosks, trolley-boarding platforms, and lighting standards are included among the public furnishings that, on the whole, still need to be brought up to the clean-cut precision of the traffic signal device and the best of the new name signs. In the home there is the china, which, more conspicuously than anything else, has stayed in the hands of the decorators; and there is the radio cabinet not yet endowed with the proportioning and simplification with which most of the new mechanisms started. Pianos are at the beginning of a new industrial-design evolution, a model by the Urban Associates now being mass-produced, and original departures from established piano form being widely exhibited among the unique creations of Russel Wright, of Gilbert Rohde, and of Donald Deskey.

The studio-laboratory-workshops of the industrial designers are centers for witnessing most vividly a new world of all useful objects and appliances, scientifically devised and satisfying to look at, passing into practical form. But the average man as well as the designer stands between two worlds. On

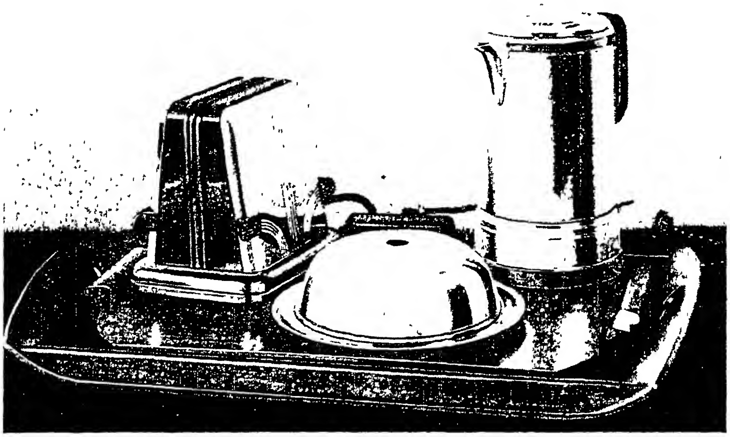


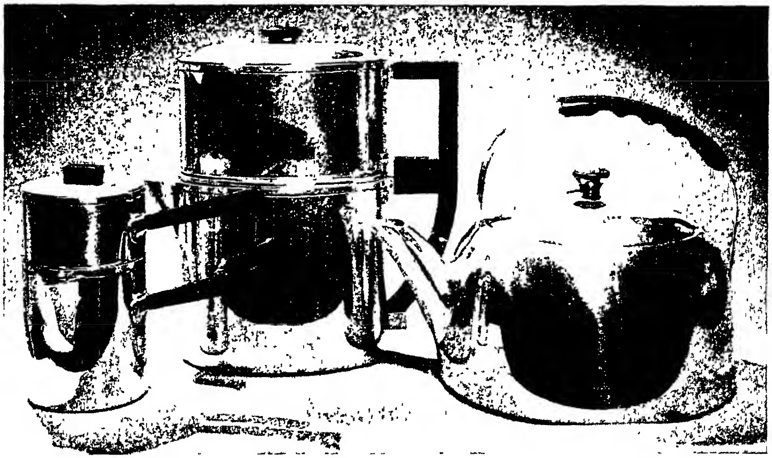


Above, bed and night table in lacquer and chromium, by Norman Bel Geddes, for Simmons Bed Company; below, piano by the Joseph Urban Associates, for Mathushek Piano Manufacturing Company.

the one hand is the old home and office environment, a planless realm, filled with a casual assemblage of variously styled and unstyled objects. On the other hand is this new world which the industrial designer already visualizes, and to a degree is already creating. The early artists, of whom we described one as wandering bewildered through a department store, became lost and confused in efforts merely to list design wrongs that might be righted. Today the designer working in the field of general furnishings, fittings, and appliances is to be visualized as well on his way with the job, as professionally secure and certain of the ultimate results. He looks about knowing that the alliance of art and industry is accepted and that a measurable start has been made toward the desirable transformation.

In inventorying actual progress in design and redesign as it is to be seen in department stores, in window displays, in offices and factories, and in domestic use, the home is the most logical starting point. The basement, the last place where consideration was ever given to appearance in the old days, is becoming conspicuously transformed. Gas and oil burners or furnaces are among familiar products of the artist-design group, many members of which have to their credit designs for model basement-area recreation rooms and suites. The now familiar weather-making equipment for heating, cleaning, humidifying, and circulating the home's air supply can be grouped in a small space. The series of formal rising elements, abstract and architectural in effect, which supplant the old unsightly heat pipes and serve new functions, have been frankly treated as an aesthetic element in some cases, and a sculptural value realized. In his model house at the Century of Progress Exposition, George Fred Keck added color to these forms and gave them the effect of a mural decoration in a gay and fantastic playroom scheme. Walter Teague and Harold Van Doren, Donald Deskey, Lurelle Guild, and Donald Dohner were among the early contributors who helped to establish the present high standard in space heating units, and in basement-space use.



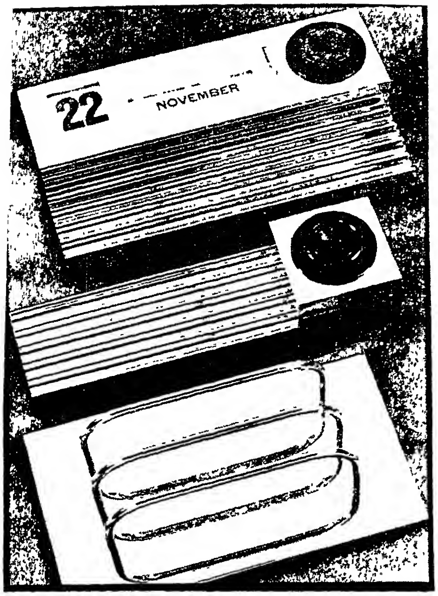


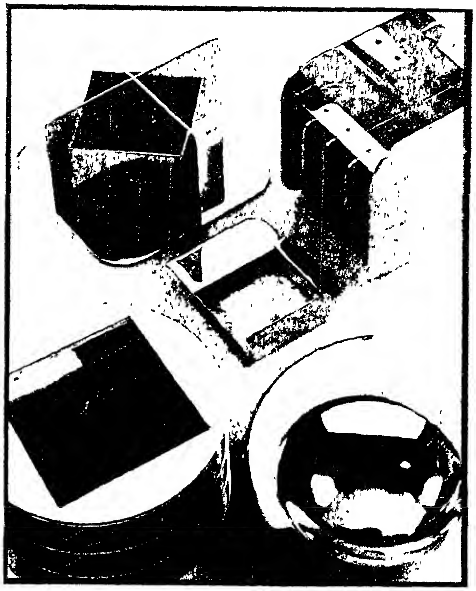
Evolution in the design of aluminum ware toward machine-age sheerness. Above, breakfast set, mass-produced by Westinghouse; below, Wearever utensils designed by Lurelle Guild.

The laundry room has, even more widely than the playroom, engaged the attention of interior designers, and its efficiency has been furthered by the ingenious provision of unit washing-and-ironing equipment by at least a half-dozen industrial designers, and the designer who has not produced at least one washing machine is the exception. Next to space heaters, washing and cleaning machines have at times been most active competitive items with the manufacturers. Once early in the history of appearance design, competition in this particular field was referred to familiarly among the designers as "the Battle of the Washing Machines." Eleven million homes now make use of this particular kind of equipment. The small product designed by Henry Dreyfuss, and illustrated here, gives an idea of the appearance standard that early began to be realized.

Vacuum cleaners have now been restudied as fundamentally as have washing machines in the competition for furthering appearance values. A small hand vacuum cleaner, for which Donald Dohner was design artist while in the Westinghouse organization, might be cited. A new synthetic material, then unfamiliar for such uses, was employed for the casing, which accordingly became a pound lighter. A high-power motor and an enlarged throat resulted in an intake of 52.8 cubic feet per minute, representing a gain of 90 per cent over the accepted efficiency for mechanisms of its kind.

True to the now axiomatic fact that the mechanical core of the house is the point of departure for modern interior design for homes, we find the greatest gain in the kitchen. The most nearly standardized effect prevails throughout, starting with the mechanical refrigerator and the automatic electric range, or the unit-built gas stove, and including the gadget for juicing an onion without filling the cook's eyes with fumes. The stove by the man who designed the Lysistrata production, which turned out to be a notable contribution to the history of the art theater, and the silvery metal sink by the artist who first brought the full value of Modernist art into advertising pages



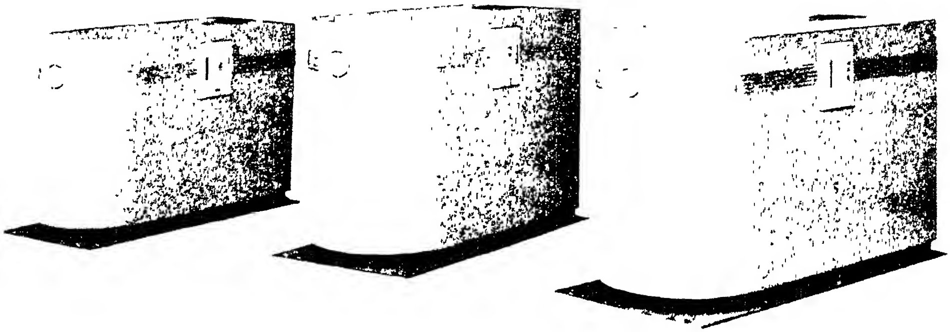


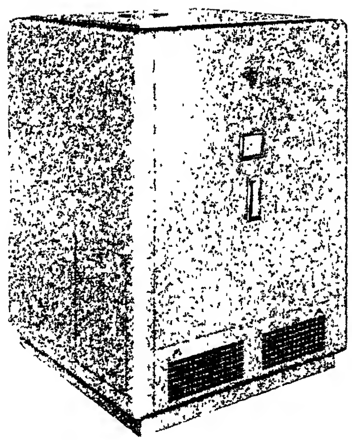
Accessories for the executive's desk. Above, ink wells and ash trays designed by Howe and Lescaze, as part of their design of the Philadelphia Savings Fund Society Building; below, mouthpiece of the Dictaphone.

are items. Paul Wiener made his own kitchen from mass-fabricated units now being made by a builder of cheap beds. Charles Sheeler, ranking with Georgia O'Keeffe as an American Purist in painting, has made his own carefully studied contributions to the kitchen.

Loewy pauses in designing locomotives and steamboats to add another model to his series of mechanical refrigerators. Dreyfuss comes from designing the interior of one of the most luxurious private yachts of the sky yet built, or from designing a Broadway theater production, to add another piece to his already substantial set of kitchen wares. When Day Lewis, the young poet, describes the fixtures of the artist's new twentieth-century world as including "tools and dynamos, bridges, towers . . . tractors and cranes" the thought suggests itself that he need only add the potato masher, the electric juicer, and the automatically timed stove to complete his picture and make it inclusive of the whole mechanized realm.

It is safe to say that every artist working importantly for industry has made his contribution at some time toward the perfected mechanism of the kitchen, that he knows the pattern made by the feet of the cook in the orderly preparation of a given meal, from stove to sink, to refrigerator, to pantry, and has studied it intently with a view to introducing new efficiencies at one or another of these points, or of making his own new version of the unit composition. There are the mechanical refrigerators. About six million were in use at the end of 1935, as compared with the 20,000 in American homes in 1925, with a declared objective on the part of manufacturers of placing two million more during 1936. The revolutionary debut of the Dreyfuss refrigerator at an exhibition of modern art in Philadelphia, has been alluded to. Lurelle Guild is responsible for the appearance design of two of the most prominent electric refrigerators and of the leading gas refrigerator on the market. Raymond Loewy turned out the metal-stripped model with the royal blue seal on the door which is now familiarly seen in the homes of mail-order





Above, oil-burner jackets, designed by Lurelle Guild for National Radiator Corporation; below, "Empire" Ideal gas boiler, produced by American Gas Products Corporation.

investors throughout the nation. The appearance standard in mechanical refrigerators is, on the whole, very good, even in comparison with other kitchen equipment and mechanical devices.

This is a situation conspicuously reversed when attention is turned to minor electrical appliances as a group. Cheap toasters and waffle irons, percolators, table stoves, and miscellaneous electrical cookers flood the market in mediocre and bad design, evidences of which may be seen in the nearest side-street drugstore or cut-rate store. The good designs must still be sought for in these wares as carefully as in china or clocks; and it is only when we juxtapose good and bad that we get the full force of the contrast. In kitchen wooden ware and pottery, in the aluminum and stainless steel and heat-resistant glass, however, we arrive again at the full experience of sheer machine-age purity of form and beauty of material, which we may go on to find repeated in the glass and silverware of the dining table, in the bathroom glasses and bottles, and in the realm of miscellaneous small objects and gadgets of domestic usefulness—the electric scissors, the torches, lighters, cocktail sets, and ash trays.

Lighting fixtures for the varied interiors of the home, and for business places, have been another of the subjects engaging general attention as a design problem. Even the interior designers whose principles operate to abolish conspicuous fixtures have produced lamps and lighting devices of great beauty and charm. There is a design group which specializes in this field. Walter Kantack, Kurt Versen, and Robert von Nessen are among its members. Working creatively and experimentally, these men and others, including Rohde, Russel Wright, and Deskey, have supplemented the accomplishments of the designers using built-in lighting fixtures, and with them have contributed to the "new interior architecture of light." Special mention might be made in passing of the extreme simplicity of means by which great distinction is realized. Nothing could be more typical of the

spirit of present-day design, or more in contrast with the old prism-hung chandeliers, than the new Pyrex ceiling bowls for which the designer found a prototype in the old-fashioned locomotive headlight.

It is hardly necessary to dwell upon the beauty of small intimate things as industrially redesigned, the cosmetic ensembles for the dressing table, the atomizers and bottles and brushes, even the matched closet accessory furnishings such as hooks and hangers and unit-formed sets of containers for personal belongings. There are, too, fountain pens and watches. Even in shops displaying the world's finest handicraft products in the field of jewelry, the new materials and the machine-age ideals of design are making themselves felt. John Woodman Higgins, the steel executive already quoted in this chapter, tells an interesting story in illustration of the changing ideal:

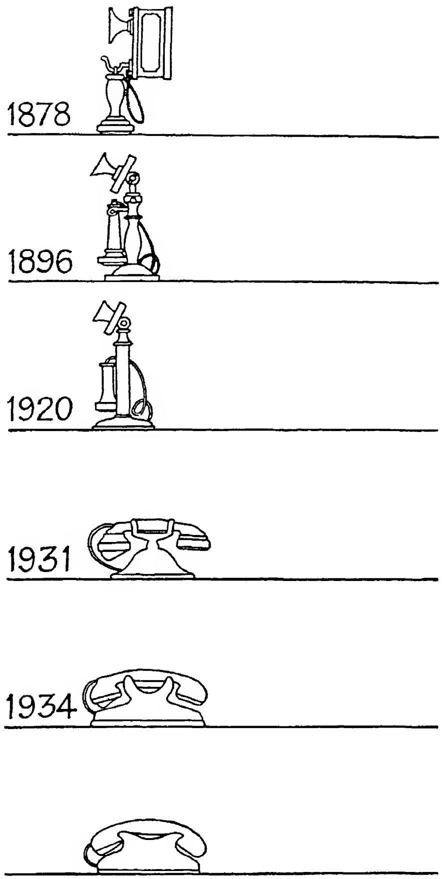
"While traveling in Switzerland some years ago, I visited the shops of one of the oldest firms of watchmakers, and inquired what progress they had made during the century. Imagine my satisfaction as a steelmaker when they showed me their best movement handsomely encased in steel—stainless steel. I purchased one of their watches and found that this steel alloy case was twenty times harder than gold, ten times stronger, and half as heavy; that it was nonmagnetic, less affected by acids and salts, and that it retained a higher polish. The value of the material in the case was only a few cents, which saved me ten dollars in the cost of the watch. Steel has a beauty and depth of sheen that is pearllike as compared with the surface luster of a precious metal or a diamond."

Something of the same effort that has been expended by American manufacturers in revolutionizing the appearance of watches of all grades has been expended, for nearly a decade now, upon the telephone. There was, however, a strong competitive urge in the one case, while in the other all experiment was confined to the one center, the Bell Telephone Laboratories, which exercise what amounts to a monopoly. The results are not yet ideal,

perhaps, but the latest telephone sets are completely in keeping with the general design trend. Loewy's evolution chart indicates the extent to which even so specialized a mechanism follows the same road toward simplification and even streamline-ism as does the automobile or the house.

When we approach the modern business establishment we find the same situation as in the home: the mechanized portions are notably modern, efficient, and attractive, while the departments which were formerly legitimate territory for the interior decorator's efforts often remain heavy with the atmosphere of past decades, with overstuffed mahogany furniture and brass ornaments, and incongruous personal treasures of the executive. Howe and Lescaze went on from major consideration of usable space in their Philadelphia skyscraper to even the smallest details of furnishings for some of its offices. The desk appliances shown are an instance. Something of the sheer-form, bright-finish, operating efficiency that pervades the machine rooms of many businesses may thus pervade the executive desk as well. There are executive suites and conference rooms by Deskey, Dreyfuss, and Hagopian which might be introduced further to illustrate the point.

The check writer, the dictaphone, the comptometer, the automatic typewriter are among characteristic industrial-design products of the outer office. The mock-leather casings of some of these appliances were one of the early sins of the new profession, committed when the Modernist's philosophy of material use was still not completely grasped. The present most apparent activity in this field is in the redesign of steel files and steel office cabinets, toward the gradual creation of an all-metal design harmony and a new high standard of operating efficiency in every piece. The desks are being sound-proofed. The dictaphone and the multigraph machine have recently been revolutionized in appearance. The electrical water cooler and the desk and floor fans are appearing in new models which make those superseded look awkward and unsightly.



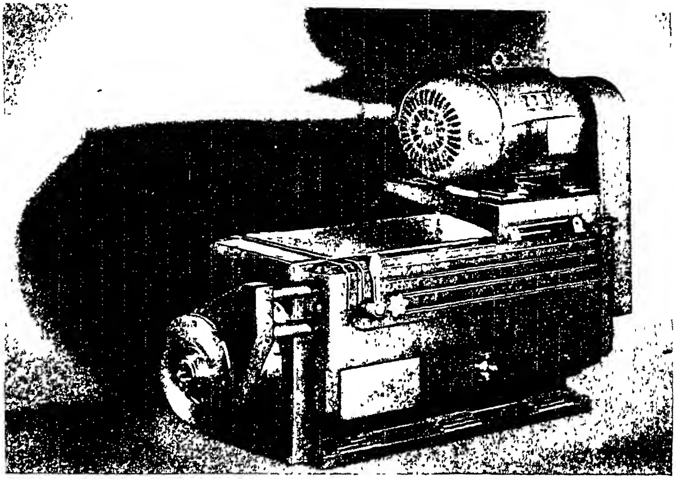
Evolution chart of the desk telephone, by Raymond Loewy. The idioms pertaining more strictly to travel machines are here evident in a small use object; as might be further illustrated in ink bottles, lamps, etc.

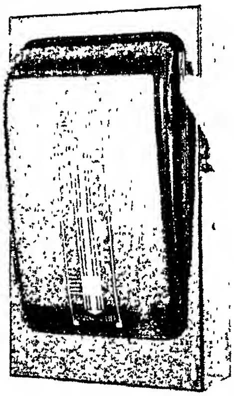
Shops as well as offices are a realm where industrial-design specialization has resulted in measurable new appearance values. The small world of glass suggested by Vahan Hagopian's recently redesigned beauty parlor, the suave cosmetics demonstration room created by Eleanor LeMaire, the kodak shop by Teague, the Dennison salesroom by Dreyfuss, the refrigerator demonstration floor which Gustav Jensen made to suggest snow sculpture: all these were designed with consideration of the ideal of interior architectural unity. But when in the corner grocery store, the neighborhood dairy, the chain-store bakery, we see Van Doren's white plastic counter scales and Teague's sales-slip register, with other equally modern display equipment and selling devices, with modern lighting and air conditioning, we know that we are indeed noting a transforming movement well under way.

The lowest priced system of cash stores of America has adopted at least a tentative program of appearance design for store equipment. At least one of the principal ten-cent-store chains recently engaged a former art-gallery executive to experiment in replanning its selling departments and store equipment. These measures represent a broadening of the appearance standards which have been employed increasingly in the merchandise and its display, and their definite transference into three-dimensional fields, where the ideal is architectural.

Heavy machines used for turning out industrial-design products were the last things to which industry at the outset would have thought of applying a standard of beauty. If only a small beginning has been made to this end, it is at least a beginning sufficient to illustrate directions which no one foresaw.

The facts which were finally grasped by manufacturers, on their long road to achievement of an art standard in the product, were briefly these: right appearance for the thing designed often demands a revolution in the manufacturing process. New materials and new methods are demanded; revolutionary economies are seen as realizable. Large-scale factory retooling





Above, heavy machine redesigned by Harold Van Doren for Excello Aircraft and Tool Corporation, Detroit; below, factory switch box designed by Ferar and Sundberg.

becomes a necessity, and the new factory machines, as in the case of the home and office mechanisms, serve best when endowed with the trinity of values: efficiency, economy of operation, and right appearance.

Harold Van Doren, with his former partner, John Gordon Rideout, pioneered in taking distinctive industrial-design ideals into this field. When the Toledo Scales Company built and equipped its new factory, these young men worked in close and continuous cooperation with the architects, directing interior appearance and machine appearance. Van Doren has remained the company's product designer, as is elsewhere noted. Walter Teague, in the early days when the pioneer designers were still struggling in the effort to compass the wide world they had been called in to revise, had the complex mechanisms of a radial gas engine unceremoniously dumped on his doorstep with a request to do what he could with them. The result was an industrial-design achievement. The mazes of piping and unassociated parts were grouped and brought into a unified composition of three main encased sections.

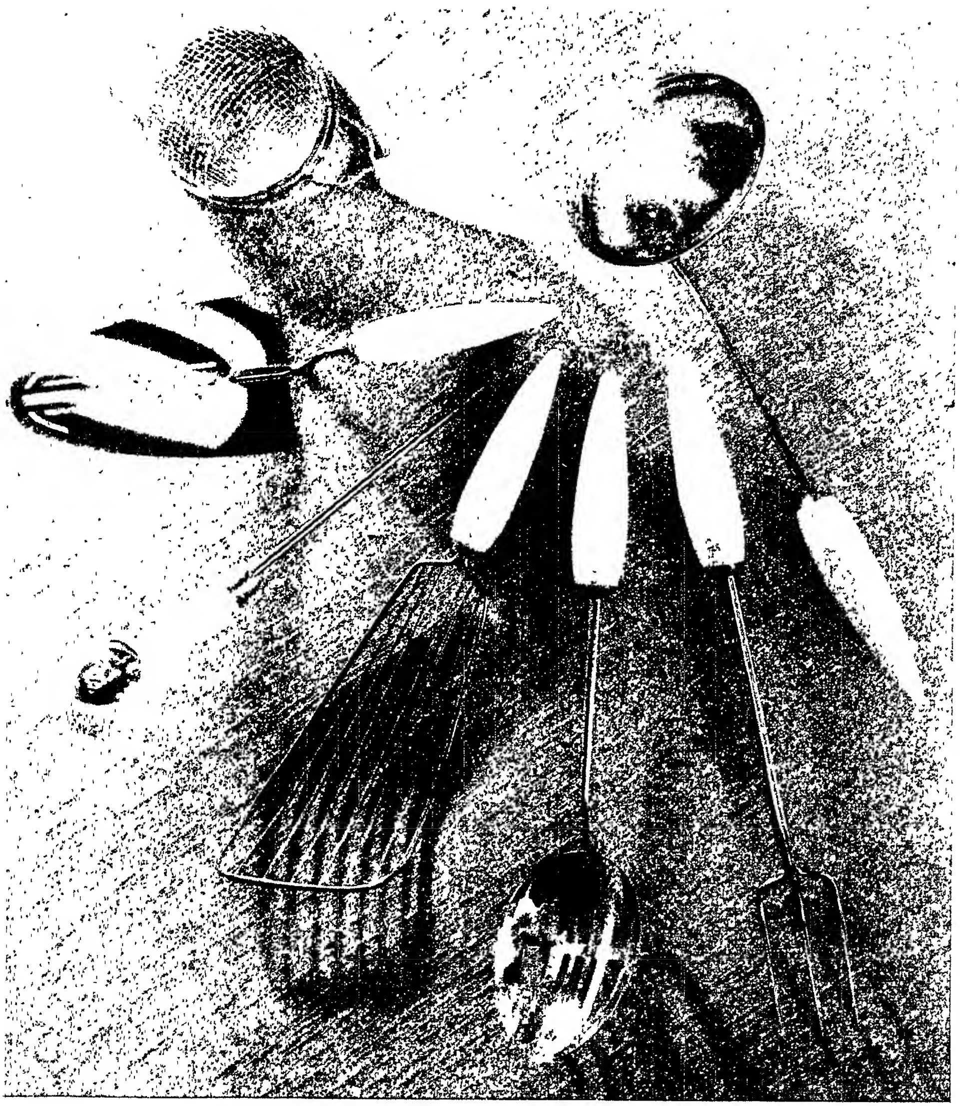
Van Doren was commissioned, on the basis of accomplishments already achieved, to appearance-design the entire output of a large manufacturer of automotive-industry tools. This equipment was exhibited at the National Machine Tool Exposition in Cleveland in 1935, where it became the center of already evident influence among manufacturers of similar equipment. A specialist publication in the field had commented editorially at an earlier date on industry's efforts to attain the extreme simplicity and beauty of modern art in their machine designs and on the artist's failure to supply them. But it now requested Van Doren, on the basis of design contributions made, to tell its readers how appearance design is achieved in heavy machinery.

Montgomery Ferar early in his practice in Detroit began to realize the opportunity in the factory-mechanisms field. At the invitation of industry, the partnership of Sundberg and Ferar is making contributions in various direc-

tions. Factory safety switches in a complete range constituted one of their first assignments.

It was the industrialist already twice quoted in this chapter who said: "Between efficiency of function and harmony of proportion there is a correlation that is deeper than surface beauty." He cites as example the internal mechanism of a multicylinder airplane engine. In the exceptional factory we find the beginning of that correlation, with already suggestions of what Henry Ford prophesied some time ago, the spread of the industrial designer's aesthetic to embrace noise and odor control; and we confidently look to the future to bring into the factory environment a measure of the unity now to be encountered in home, business office, or store.

Everything then is included, somewhere, in the work of the industrial designer: "Everything from a match to a city," according to the motto of Walter Teague; everything from a locomotive to a letterhead, as in the practice of Otto Kuhler; everything from a skyscraper to the hook for the business executive's hat, which may be exemplified by the work of William Lescaze. Whether or not each of the utilitarian objects necessary to the completion of categories established in this chapter is yet available on mass-production terms, with its aesthetic standard and its economic advantages both fully realized, we may feel sure that industry has already put it into the works or that it exists in the form of a drawing-board visualization or clay model in some design studio; or that it at least has presented itself to the fertile brain of some designer. What it all adds up to is this: everything is being reconsidered, an appreciable beginning has been made, the philosophy that *beauty is use, use is beauty* is effectively at work at the source of all our daily furnishings, appliances, and mechanisms.



Kitchen utensils redesigned by Henry Dreyfuss for the Washburn Company. An increase of one-quarter cent in manufacturing cost of any article would have prevented the manufacturer from utilizing the artist's improved design—indicating the close cooperation necessary between artist and organized industry.

11. JUSTIFICATIONS IN INDUSTRY

IT has been said that annually design projects involving ten billion dollars' worth of staple commodities pass through the hands of regular practicing designers. It has been said that there are industrial designers whose annual earnings from this source run well into six figures, which means that they rank with bank presidents, industrial executives, and motion-picture stars in the highest income group in America. Such facts, however true, have lent themselves at times to too easy generalization about designers and design, as have cases of manufacturers pulled back from the brink of depression disaster by the timely arrival of the new figure with his portfolio of ideas.

The more representative fact today is that the manufacturer expects to use the services of a competent artist when occasion arises in much the same way that he uses legal services, and to pay accordingly; the generalization now safely to be made, therefore, is that in all representative fields of manufacturing, there are established procedures for this use. Both substantial members of the profession and industrial executives are working toward a wider acceptance of the nature of the relationship and the benefits which may logically be expected to accrue from it, to manufacturer and to designer.

Analysis of practice shows that major industries are tending to develop their own permanent design departments and, where their products are widely varied in nature, independent industrial-design service for particular divisions. Some organizations have advisory boards or committees composed of prominent professional artists who confer with executives upon current problems of appearance, and make recommendations. A successful industrial designer often serves as consultant to the department, board, or committee, and the services of free-lance designers are also frequently used on special problems.

In lesser industries the designer is given a retainer with obligations to sit in periodical conferences with officials, giving advice as to trends and methods of meeting competition, and executing an occasional design commission. Or the producer may retain him to redesign gradually the entire output, and then contribute yearly models to keep the product up to date. The consultant brought in for these services often works simultaneously for a dozen different manufacturers, and there is no objection upon the part of any of them so long as no direct competition arises. Industrialists, in fact, go by choice to the designer responsible for the most successful current products; and it has even been reported that an artist realizing a brilliant market success immediately receives many bids for his services.

The industrial designer often becomes inventor on his way to new solutions. Sometimes he makes his first approach to an industrialist with already patented models and working drawings. That is what happened in the instance of a recent popular-priced novelty watch. It happened much more dramatically in the widely publicized case of a mechanical toy. The plant approached had just become insolvent, and was in process of being taken over by creditors. There was an unusual element of speculation, therefore, in the decision to bring out the product as a holiday novelty. The risk was not only justified by the phenomenal appeal of the contrivance but led to further activities in new and more stable products. By far the more familiar procedure, however, remains the employment of the designer for specific work on stipulated products, singly or in small groups.

The scope of the design problem even in one major organization is often wide, as in the case of the Westinghouse Electric and Manufacturing Company, or the General Electric Company. Both of these organizations arrived early at belief in the desirability of introducing appearance standards into their products of all kinds. The Westinghouse Company builds locomotives, power-plant equipment and other heavy machinery, originates new

products designed to use industrial materials of which it has control, manufactures electrical equipment for household and business-office use, and—to complete the range—originates new practical uses for the photoelectric cell. This corporation used the services of Donald Dohner first as artist consultant and then as artist director in the general engineering department; it now uses a series of industrial-design services in specialized fields. For instance, the subsidiary corporation, the Westinghouse X-ray Manufacturing Company, retains Walter Dorwin Teague for all products, while the Household Equipment Division uses a staff of general and special designers, including architects and interior designers, and the General Merchandise Division in Pittsburgh has its own organization for achieving appearance design standards.

As early as the mid-twenties, the General Electric Company took steps to coordinate its entire style and design effort. It appointed a general committee and vested in it responsibility for "proper balance among the principal factors to be considered: (1) practicability from the standpoint of production; (2) efficiency; and (3) appearance." This committee has been variously reorganized and some of its increasingly complex responsibilities have been subdivided and regrouped, but the principles and policies remain the same. It was the practice of the committee from the outset to "sit down with the engineers and designers directly responsible for the product and work out with them a final design to represent the most attractive possible appearance commensurate with utility." The product might be a pot or kettle, a toaster or curling iron or stove, or heavy machine, or street-lighting unit for the central area of some city. In one instance it was what seems to have been the first mechanical refrigerator on which professional industrial-design services were employed, the one on which Henry Dreyfuss came in.

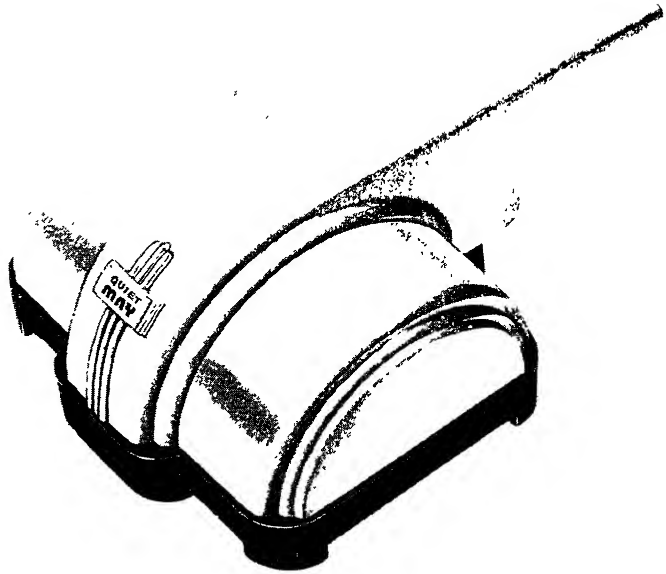
More significantly, the committee arrived (almost simultaneously with the arrival of the first machine parts in New York art galleries as exhibits of

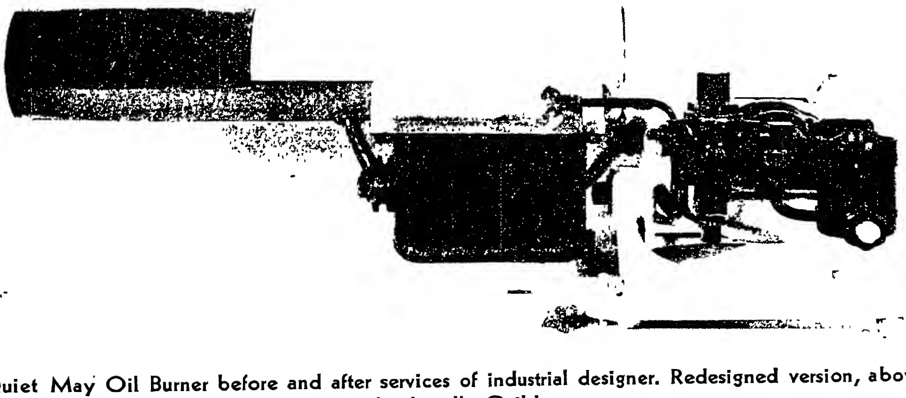
functional and abstract beauty) at a standard of appearance for industrial equipment and for plant interiors. It was one of the early indications of the growing subjective consciousness of the machine as symbol of modern designed living, though machines themselves had not yet been recognized as appropriate objects for artist effort. The first important step in the direction of that new and promiseful field of specialization had been taken, however, when the company could report:

"General Electric Company motors, turbines, switchboards, represent equipment which is installed in plants where public inspection is often invited. For this reason it is important that it present as attractive an appearance as possible. Accordingly smooth surfaces and regular curving lines are the objective. Wherever possible sharp angles are rounded off, protruding nuts and bolts submerged, and frequently unattractive and irregular mechanism is totally encased in a metal envelope in order to secure the proper compact, unbroken effect.

"In the case of switchboards, instruments are designed and arranged in a way to present a symmetrical appearance as well as for convenience, and attempt is made to have them harmonize in color and form with the surroundings. For example, all metal fittings are given a uniform color."

What is now known as the General Electric Appliance Design Committee is composed of merchandising, engineering, and artist representation, with a personnel drawn from various departments: General Electric Houses, Inc., and the air-conditioning, refrigeration, and range-engineering units. Ray Patten, the industrial-design member, is consulting designer, and supervisor of the Merchandise and Appliance Department. "From time to time," he reports, "additional designers and consultants are temporarily retained to confirm our judgment in major decisions. The outside consultants are usually chosen from those who have been most successful in the design of consumer commodities."





Quiet May Oil Burner before and after services of industrial designer. Redesigned version, above, by Lurelle Guild.

Another pioneer organization, and one which has given equally careful attention for at least a decade to the aesthetic aspects of its design problem, is the Bell Telephone Laboratories. In the long process of evolution which has produced the present hand telephone (with the complete mechanism now absorbed in the one simple instrument), the services of a committee of artists and architects have been used, and a prominent industrial designer has often been brought in for consultation.

Here, as throughout groups of industries and large merchandising establishments and distributors controlling the character of their wares, there is a marked tendency to subordinate the identity of the industrial designer, or, as he is still often called, the style and color artist. Notably in the case of the entire automobile industry, anonymity surrounds the artist. This is in keeping with the general policy of suppressing the identity of all contributors to the product in the interest of a maximum publicity value for the advertised trade name. Several industrial designers whose names are used throughout this book have been commissioned to produce models for leading automobile manufacturers. All of them except Walter Dorwin Teague have been required to do so anonymously. In at least one case the industrial designer's models as produced represent a departure from established design at least as revolutionary as was the first streamline train. This design has been an influence on all subsequent automobile appearance. The secrecy surrounding the work was enforced to the degree that even the artist's colleagues still remain largely unaware of his contribution.

The process by which the current season's streamlined models of all mass-produced makes are arrived at is carried on by an autonomous design, or art and color, department where a large staff of artists, designers, and model makers work. This department works considerably in advance of factory production, but it does establish the future trend and produce detail used on outcoming models. Customary procedure is to change body dies every

two years, and the same dies are usually interchangeable over a whole line of cars, often bearing different names, as in the various units of General Motors, and Chrysler, the designer providing different radiator grilles, hoods, and details. The department head with company executives reviews work done by individual artists and selects that detail which is felt to be most acceptable to the public and which is best adapted to production on an economical basis. The process is largely at this stage one of cautious advance within the limits of accepted appearance style rather than a bold capitalization of engineering gains (now being steadily realized throughout the entire industry).

The extent to which industry is influenced by outstanding American merchants in its acceptance and use of industrial-design products is almost impossible to gauge. The merchant must interpret the public to the manufacturer, and the industrial designer to the public. The magnitude and scope of the total present-day effort in this direction may be indicated by reference to one establishment, that of R. H. Macy and Company, of New York, which has 150 departments and sells over 300,000 different articles of merchandise. Not so much because this is the largest department store in the world as because it was an outstanding pioneer in behalf of an artist standard in mass-produced goods, the statement made by Percy S. Straus, President, as to the present-day merchant's attitude, is of consequence:

"The American merchant today finds himself increasingly concerned with the design of the merchandise that he buys and sells. If he is farsighted, he studies public taste, its sources, its trends; he is alert to new influences in design which may be interpreted in terms of fresh color, shape, line, mass, or pattern, or any combination of these in objects of commerce. He keeps a constant eye upon the expositions of new kinds of design; he cooperates with the working schools and the industrial designers. He employs his own staff of designers and will certainly find occasion to work closely and con-

stantly with the designers employed by the manufacturers. He trains his own staff in the principles of design as it touches public taste. From time to time he finds it to his advantage to pioneer in design in broad gestures, such as in organizing expositions of modern furniture, or interiors, or architecture for the general public.

"Every farseeing executive should make his store a community center," Mr. Straus believes, "whether it be the center of a neighborhood or of a metropolis; and the American merchant is well aware of his obligations and opportunities of leadership in the creation of new high standards of design throughout mass-produced commodities."

It seems particularly worth while to note also that the leading mail-order merchandisers, notably Sears Roebuck and Company and Montgomery Ward and Company, the two largest, have adopted policies of redesign for large volumes of their entire products. Not one but many kinds of industries produce commodities directly for them.

Montgomery Ward and Company began in 1934 the redesign of its merchandise to bring it into line with modern appearance standards. Miss Anne Swaynson is Director of the Bureau of Design, which has a permanent staff of accredited artist-technologists. She describes the procedure which always goes on with close cooperation of the merchandise divisions concerned and with reference to manufacturing practice:

First, there is a thorough study of the needs; then rough preliminary sketches are developed; the merchandise division executives, and often the manufacturer, analyze these sketches with the design director; when sketches have been produced which meet with the approval of all concerned, working drawings are made and turned over to the manufacturer.

The Sears Roebuck Design Department has a director, A. J. Snow, and a staff of artists, and works in conjunction with a large engineering staff. Describing the policy which led to the establishment of the department,

and present requirements, Mr. Snow says: "The design of merchandise must be in keeping with the modern tempo to appeal to the present-day taste of the customer. The designer's responsibility is to create an item in good taste, that functions as well as or better than that which is available within the cost limitations as set forth by sound merchandising practice." He adds, "The influence of design in any case is not dependent alone on whether it is good design, but on whether thought has been given to its relative place in the merchandising scheme, and how it is to be engineered and produced to attain the right results."

The Kroehler Manufacturing Company, producer of furniture which is widely distributed throughout the United States and Canada, voices an appraisal of industrial-design service based upon experience with Gilbert Rohde and others, and typical of expressions from industrialists in this field. D. L. Kroehler, Vice-president, says: "A great deal of credit must be given to the work performed by industrial designers during the past four years. In the furniture field, they have created styles, using the living needs of this age as their basic principle, and making the outward appearance an expression of those needs. General public acceptance of these new styles has been especially favorable and has proved an important factor in the present recovery in the furniture industry."

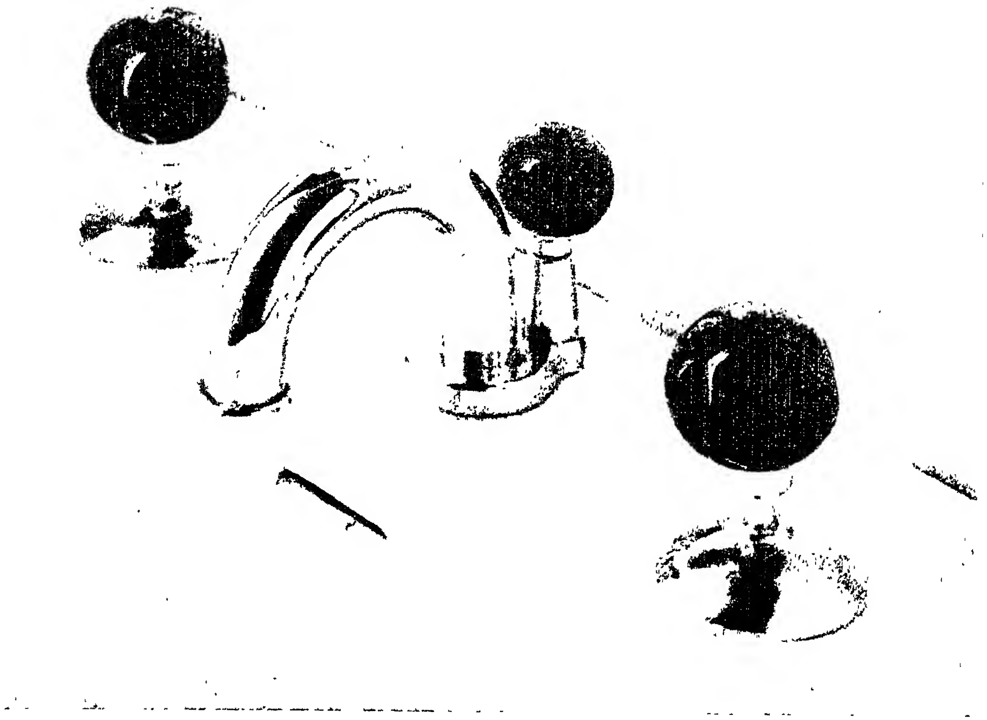
Representative industries and distributors know what they want. Primarily, at least at present, they want greater salability in their merchandise; they want "appearance," in advance but not too far in advance of competitive products; they want solutions that lend themselves to good and economic engineering; and they want that still intangible essence of machine-age style which we are regarding as an aesthetic product. It is interesting, therefore, to ask what the artist sends or brings to one of those round-table conferences where engineer, merchandiser, manufacturer, and design department head sit, with their divergent demands to be satisfied simultaneously.

A successful product, well conceived as to "relative place in the merchandising scheme," and one in which artist, manufacturer, and merchandiser had reason to be well pleased, may be cited as example. It is Raymond Loewy's mechanical refrigerator designed for Sears Roebuck and representing one of the earliest major efforts to market mechanical freezing equipment through mail-order channels. It represented superior engineering features used to the maximum by the designer for achieving his appearance values. It was timed to the psychologically right moment for catching the enthusiasm of a large buying public. The result was that it moved from eleventh to fourth place in a highly competitive market in the first year, and thereafter went steadily forward.

This is one of the typical examples of industrial-design sales successes, an unusually good one to illustrate the fact that the industrial designer, as he is first to insist, is seldom alone responsible for the new record. The 50 or 100, or 200 per cent sales increase on a redesigned model—or the 500 or 900 per cent actually realized in some recent cases—or the taking of the field by the newly created product, arises usually from a complex of factors.

The truth is that there is no industrial-design cost-accounting mathematics at the factory. No one has yet devised an accurate equation to show, as can be shown for the advertising, research, and engineering departments, how the artist's record actually stands. Men, however, whose names as industrial designers are insistently connected with records of outstanding market successes are beginning to be classified as among industry's conspicuous resources. Meantime, industrialists and the designers who work closest and most confidentially with industry equally deplore the spectacular successes which have been seized upon and publicized to the artist's credit, without a taking into consideration of the other factors involved.

"Just how much of the sales increases we read about can be attributed to what the industrial designer actually does, nobody knows," Harold Van

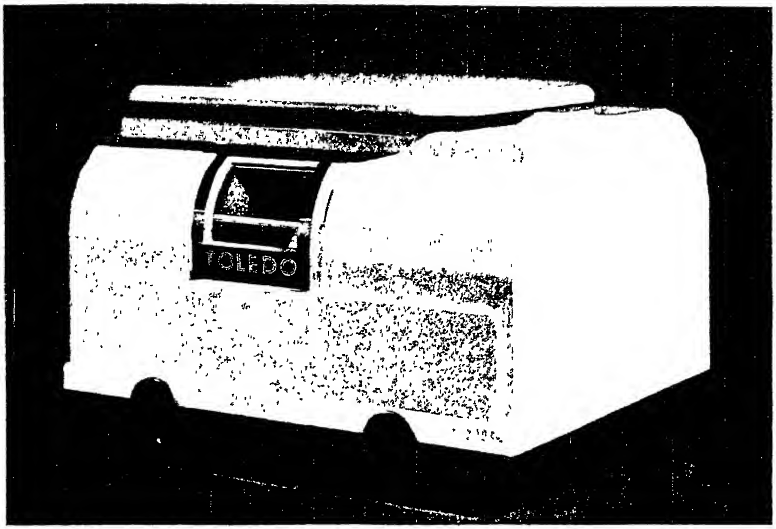


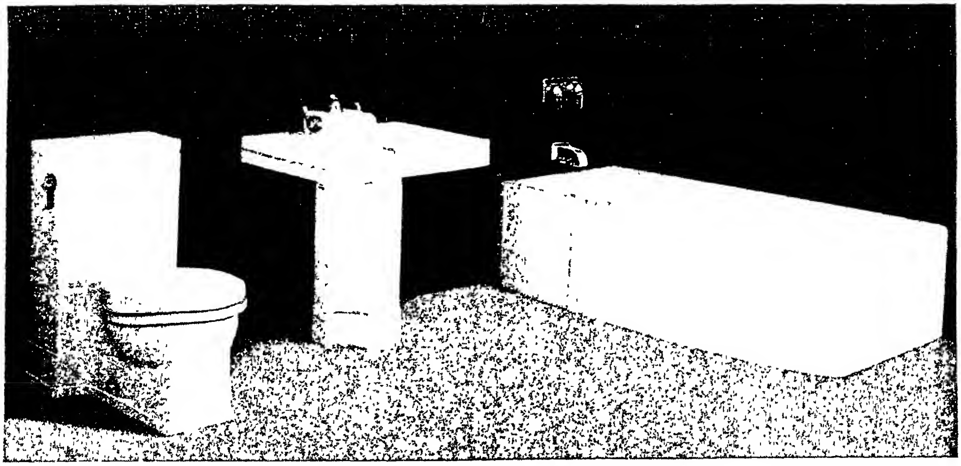
Faucets designed by George Sakier for American Radiator and Standard Sanitary Corporation.

Doren says, taking to illustrate his point one of his own designs, a gas conversion burner. This product increased the sales of the company from 35 per cent of the entire field to 60 per cent in eight months. "Naturally I should like to attribute the gain entirely to my design," he confesses, "but the design was merely the fuse that set off a whole train of charges—a large advertising campaign, a bigger and better sales drive, better engineering, and better promotion. The new appearance design worked up new enthusiasm; but without the other factors the burner might have been styled by Michelangelo and yet have been a failure."

The manufacturers of a small low-priced radio which is a Van Doren design product are less conservative as to credit due. In three years the product moved from seventh to second place in its own particular market, the molds are still running, and an export market developing, in all of which the appearance value is considered of primary significance. The record from the Toledo Scale Company regarding its latest product is similar. This undertaking was unusual in that it represented the redesign of a counter scale by the collaborative efforts of six separate companies. The result is an efficient, attractive new product, interior lighted, one third the weight of its predecessors, and housed in a single plastic molding—the largest of its kind ever cast in this country. Three months after this product appeared, sales of the division were shown to have increased 45 per cent. "Of course there were other factors," one of the officials of the Toledo Scale Company says, "but we believe that the design was a strong influence."

The General Electric Company, working with its own design committee, undertook to produce an electric fan which would represent a revolution in engineering and appearance without increased first cost or cost of operation. Air delivery and velocity were increased to meet the record of larger fans, and silent operation achieved. The three chromium-plated blades (instead of four in conventional fan design), the blunt-nosed projectile-





Above, counter scales produced by Toledo Scale Company, Harold Van Doren, designer; below, plumbing fixtures designed by Henry Dreyfuss for the Crane Company.

shaped central housing, and the lines of the wire guard are effectively utilized as elements of the appearance design. The backward sweep of lines forming the base and the arm, initially conceived to give greater stability, imparts a new character to the whole. Success was instant when the fan was marketed, and production had to be doubled, due, according to officials, to "style and fine appearance."

When the Todd Company developed a new protectograph, they retained Henry Dreyfuss as industrial designer. His problem was to make solutions having to do with the practical function of the machine, and to devise a distinctive and unusual appearance and yet one in keeping with conservative bank and business-office interiors. The keys on the new check-writing machine, replacing levers, became black and gray against a red background. The case is streamlined with narrow silver strips used to relate machine and base. The simple handle is of chromium and black. The machine is black, with the trade mark in red, black, and silver, appearing as the central feature of the design and functioning practically as a latch for the removable front. The first year's sales represented a 66 per cent increase over the record of the old machine.

Such notes from designers' records in industry might be multiplied indefinitely and extended to cover all the categories of humanly useful products already discussed, to show further that industry is now using art services very widely. They might be adduced to make the point that the profession in general is lucrative, with some extraordinary income records even as viewed from a conservative point of view. It is sufficient, however, to have indicated how the central movement is steadily in the direction of a stable, permanent relationship which is proving, on the whole, satisfactory and profitable.

Fresh collaborative efforts are being made to establish an organization jointly representing artist and industry. There is conviction that the time has

come for a central clearing-house of information and service and for the clarification of standards governing the profession. Efforts in this direction started in the twenties, and led ultimately to the organization of the National Alliance of Art and Industry, a strong representative agency which functioned for several years under direction of Alon F. Bement, only to let its activities lapse in 1936. Failures from first to last have been due largely, it would appear, to lack of a common understanding of the relationship and what logically was to have been expected of it by each side.

Certain of the art museums have exerted their influence in the direction of a permanent association, throughout the period of tentative and experimental working relationships between industries faced with new and bewildering necessities and artists sensing the opportunities in factories yet without adequate preparation for meeting the machine's necessities. The Metropolitan Museum of Art particularly has been a powerful pioneering center, with a special department through which its resources have been available to industry and to the artist-designer. Richard F. Bach, who has been responsible for much of this work, took the initiative in early efforts looking toward a permanent union of industrialist and artist, with full co-operation from the museum's executives.

These activities in general have been removed from the specific field covered by this book because the distinction was not clearly made between machine-craft needs and the values of handicraft and continuing two-dimensional design. The assumption underlying the museum's efforts was that the best possible service to industry would be to open, by way of able artist-interpreters, the treasure house of the decorative arts of the past. In so far as the machine was overlooked, as a factor establishing its own aesthetic and its own toolmark, the effort failed to be significant in the mass-production field. Nevertheless, in a very true sense industry was reintroduced to art, and made to feel the need of design at a new level. The

Metropolitan Museum, moreover, for several years organized and presented industrial art exhibitions, at which, among decorative arts exhibits, the machine-age products of the men here discussed were shown to a wide public. Similar service has been rendered by the Pennsylvania Museum of Fine Arts.

It was the Newark Public Library and Museum, however, which was the true pioneer. The information and service extended by this institution for nearly a quarter of a century have been a wide influence in promoting acceptable design standards in useful industrial products. The late John Cotton Dana, Librarian and Museum Director, must have begun as early as 1912 to realize something of what today appears as the central truth of the machine-age aesthetic: that the machine as instrument determines the character of the product. In that year he imported a first exhibit of distinctive industrial products. That was the beginning of activities which were wide and varied, but all with the one objective of bringing the designer back to the true place of importance he had had in the days of fine craftsmanship, as artist and as worker. The present librarian, Miss Beatrice Winser, published for several years, as a part of the continuing activity, a bibliography of industrial design, and has more recently organized and presented group exhibitions of the work of leading industrial designers. The library is source for as complete current printed material on developing industrial-design practice, American and European, as is to be consulted in any one place in the metropolitan area of New York.

Another continuing influence toward stable relations between industrialist and artist has emanated from the advertising agency that is presided over by Earnest Elmo Calkins, known as the Dean of the Graphic Arts, but with equal propriety to be termed diplomat and consular representative for the artist at the factory. He became a prophet for "Beauty in Factory Goods," writing articles and books on the subject when the idea was still

so revolutionary that it was in some places mistaken for humor. Out of his organization came the "consumer engineering" profession, crystallized and given shape chiefly through his efforts and those of his associate Egmont Arens. This intermediate activity is concerned less with individual industrial-design products than with appearance as a broad economic asset.

Egmont Arens is an artist, and originates merchandising plans, packaging and store interiors for chain stores; but he also compounds from scientific, social, and less explicable means forecasts of future appearances. He was, for instance, employed by a corporation in 1931 to prefigure train appearance as it would be five years later. The accuracy of his prophecy, covering a period which brought complete revolution in the accepted idea of train appearance and performance, was hardly less than phenomenal. It is particularly impressive to hard-headed businessmen, in a heavy industry which is necessarily slowgoing and cautious in its advance even though accustomed to thinking in terms of long-range investment. Arens by being artist was able to forecast changes undreamed by executives and engineers. Before the end of the five-year period, every item in his list of impending transformations had eventuated.

This is one instance of a new kind of service which lies along the direction of the soundest future relationship between the prophetic figure of intense creative vision and the economic realist. Progress by reference to customer acceptance, and redesign as a technologist's procedure without artist foresight, could never have produced a new thing like the streamlined train. In reasoned correlation with coldest logic there must be bold prophetic vision, the reliance upon intuitive judgment. This is what the consumer engineer and the industrial designers who are similarly visualizing came to the field to do, and what, to some extent, they are doing.

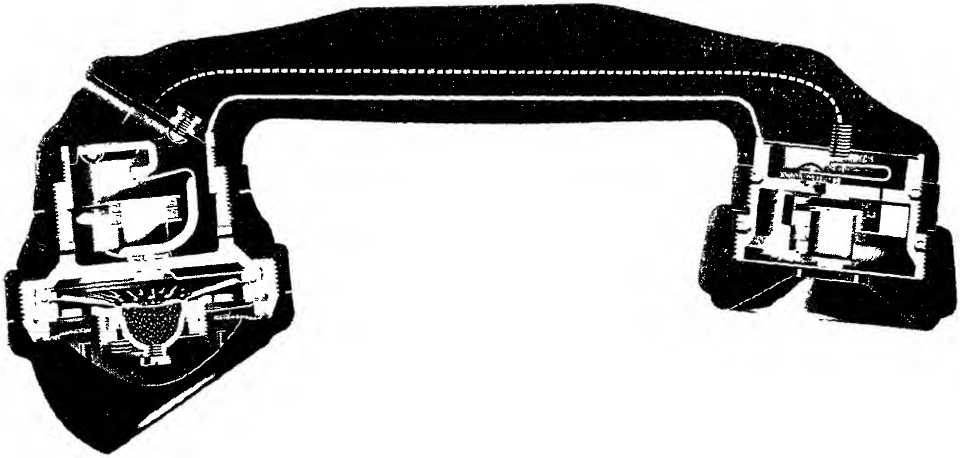
One of the greatest present dangers seems to be that aspiring young designers may undervalue the creative aspect in favor of economic expedi-

ency, and the way thus be opened to a vintage of mediocre design work. This is not primarily industry's doing. The artist is brought in first of all because he is an artist. His intuitive judgment and his sensitiveness to formal values are expected to come into play upon the problem given him, and to determine the new solution. This is taken for granted by the group of realists sitting around the conference table: they are specialists in fields other than art as such.

At this moment of reaction from earlier mistaken efforts, and of reshaping and consolidating, important industrialists are going ahead of artists themselves, often, in affirming faith in the creative product. Two quotations from widely different sources will serve to show the permeative influence of this new machine-age idealism. One is from a manufacturer of prefabricated steel accessories and parts, and the other is from a prominent producer of materials such as lend the peculiar machine-age glow and gleam to so many industrial-design products, whether in architectural accessories of chromium or the kitchen sink and its equipment of monel metal.

John Woodman Higgins, President of the Worcester Pressed Steel Company, says: "Our products, while requiring engineering functional design, are made subservient to the artist who designs the finished product. Our engineers cooperate with the designers, and frequently are able to influence and contribute toward the goal of making all useful things beautiful. Ugliness, whether expressed on canvas or radio cabinets, is an offense against civilization, and two ugly objects are twice as harmful as one; while the mass production of a number of ugly objects for wide distribution is a matter of serious concern."

Robert C. Stanley, President of the International Nickel Company, adds this affirmation of a positive faith: "We who have been trained as engineers and who have worked at that profession have always lived among things of beauty, whether they be an assembly of roller bearings, a suspen-



Section through handpiece of desk telephone, indicating exacting mechanical and structural limitations upon the designer. *(By courtesy of Bell Telephone Laboratories.)*

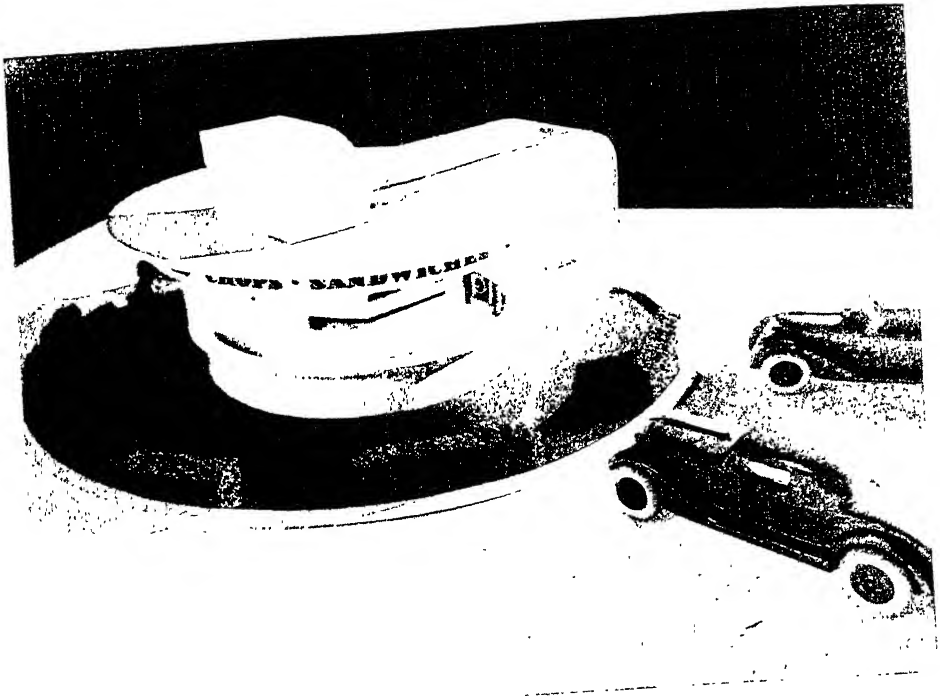
sion bridge, a head frame of a deep mine shaft, or a lofty bay of Bessemer converters. The satisfactions which we derive from seeing a mighty steam hammer forge a white-hot ingot are those of every creative artist, although our vocabulary for expressing those satisfactions may not be wholly aesthetic. We are used to art in the making and in its functioning, and we are becoming used to the attention which more formal artists are now paying to our daily activities.

"It would seem to me that engineers, through their development of the Machine Age, have been important allies of the artist in emphasizing that functionalism is a basic factor in true beauty. Just as the Greek sculptors went directly to the anatomy of the human body to create their best statues, the artists of the present day are stripping off the 'gingerbread' and the general fussiness affected by their immediate predecessors, in order to bring out the fundamentals of an age in which great machine tools and machines produce the miniature machines that have taken over so many of the old manual processes.

"Through the industrial designers the world of formal art is accelerating and guiding the present trend to the great advantage of us all. The antithesis of overdecoration is starkness, and the one is as destructive of beauty as the other. To strike the proper balance the industrial world needs competent advice. Although our company is engaged primarily in the production of metals which go into many of the alloys now widely used in the manufacture of consumer products by others, we recognize and value highly the contribution which these intermediaries between formal art and mass production bring to raising the general level of good taste and of human satisfactions."

Nineteenth-century American industry achieved quantity production. Twentieth-century American industry may be shown in retrospect to have achieved quality production. The manufacturer of today is summoning the artist to join him on the great adventure of realizing that quality. It is adven-

ture enough, surely, to engage all the courage and ingenuity and vision that both can summon for some time to come. The outcome, obviously, depends upon the extent to which a public, discriminating and continuously critical in the constructive sense, becomes the third participant.



Design for a roadside sandwich counter. Student work at the Art Center School, Los Angeles, under instruction of Kem Weber.

12. DESIGN, THE MACHINE, AND EDUCATION

ALL our studies and investigations have led down to one central conclusion: the orderly advance of industrial design depends upon coordination of mechanical-industrial progress and artistic invention. The two elementary factors, each incompletely expressive and half valuable without the other, are machine-technology and the artist's unaccountable genius or aptitude for design. Education, to be serviceable to the future designer, and through him to the artist-transformed world, must reckon with this fundamental.

Even the briefest survey indicates a lack of schools bridging the two fields; and the most exhaustive search of the educational scene leaves one with the conviction that educators still are thinking in terms of the old divided world: of the machine as one thing, important in the work life and as practical servant of man; of art as another, existing (rather ornamentally) in a realm totally removed from that of practical affairs. The colleges keep on graduating efficient engineers and mechanics, and the art schools annually turn out flocks of good two-dimensional designers and a few promising handicraftsmen. But there is hardly an attempt anywhere in the land to coordinate training in machine technology with the organized effort to evoke creative artistry and to foster aesthetic creativity. There are, in short, nineteenth-century colleges of engineering and nineteenth-century art schools and handicraft schools, but there are no twentieth-century art-in-relation-to-technology schools.

Occasionally there have come from farseeing artists, or from manufacturers, statements regarding the need for this dual preparation and for the typical machine-age school; but they remain paper statements. Any account of education as it is, in relation to the new union of art and industry, must

deal largely with the insufficiencies of the institutions quaintly called "schools of industrial art," and with—plans. Real advance waits upon recognition, by the educators, that the vital art of America is being created where artist and machined industry have come together, that a new aesthetic is emergent, and that to name an institution "school of industrial arts" and then teach in it graphic design and the handicrafts is an anachronism and a betrayal of the student.

This is how those concerned with the new industrial design (including Modern architecture) are presenting their case before the educational authorities. The mastery of machine technology, they say, has marked a new stage reached in man's evolution. It has revolutionized his occupational activities, his relationship to the sustaining world, by shifting to the machine the main burden of supplying his wants. By the same agency his environment, his movement range, and his activity pattern have been changed more in a single generation than in any millennium of earlier history. There is implied in turn a new culture and a profound change in the arts. Already in fields of production not previously considered as concerned with art, there is, in a thousand daily used things, a unique art impress speaking unmistakably of the machine. That the artist shall increasingly add his refining touch and enrichment, his creative form, to these lived-with things, whether working mechanisms or houses or playground toys, would seem to be along the only conceivable way of progress. If then, as we believe, education is the one dependable instrument for rendering men elastic-minded in the face of change, and for coordinating the agencies of change, is it not fair to look to the educators for recognition of the all-important alliance of art and industry, even to the extent of establishing schools to train the key figure, the industrial designer? Will not the creation of a series of such schools be the one complete and inevitable answer of organized education to the challenge of an industrialized world?

Although there are a number of successful industrial designers in the country today, they have arrived at their present secure position not by logical preparation but by sheer genius or talent (evoked partly by the magnificent opportunity) and by trial-and-error progress. Not one of the men shaping our refrigerators and our ash trays, our stoves and our clocks, was schooled with the expectation that he would design and style factory-multiplied goods. Most of them were drawn from the fields of stage decoration, graphic design, interior decoration, and fashion design. Hardly one was trained even superficially in machine technology, in the all-important processes of industrial manufacture. As a group they have had to meet industry's criticism that they lean perilously to the side of dressing and two-dimensional appearance-designing because they do not know thoroughly enough the working organism and the engineering routine in the factory.

The new profession has justified itself beyond serious challenge, but the pioneering period has been made at times unduly trying to all concerned through the artist's lack of preparation. There has been a margin of lost motion, even friction. There has been, too, a real waste of time and money on designs prepared but later proved unusable or impractically expensive. (It is just possible that sometimes the obstacle has been a manufacturer's shortsightedness or lack of daring; but the artist at least must take his share of responsibility.) The question then is in order: would it not have been better if the designer had been equipped in school—yes, even in art school—with the knowledge of engineering and machine practices which would have precluded the waste? And looking forward to the time when, inevitably, artists will sit high in the councils of all manufacturing concerns, is it too early to ask the educational authorities to provide what may be termed art schools specializing in machine craftsmanship? When will art education recognize that man has entered into the power age and that he should no longer be trained exclusively in the methods of the manual age?

There are today scores of schools and college departments operating under the "industrial arts" name. Yet a survey indicates that there is only one institution equipped and manned to add to its creative art education a first-hand mastery of the machine tools which determine industrial-art forms. What then *do* the so-called industrial-art schools teach? And how did they get so out of touch with industry's central demands?

The separation, of course, goes back to the old quarrel between the arts and crafts people and nineteenth-century industrialism. The academic artists and the handicraftsmen won the training schools over to their side. When it became obvious that graduates were wholly unfitted to practice their arts profitably, or usefully, in the world as it is, there arose the cry that the training must be made practical. Many schools then went over to the "useful arts," putting in courses that prepared the student to make lamp shades, build stage settings for the little theaters, design Christmas cards and posters, and draw pictures for the fashion magazines. To these were sometimes added courses in pottery making and in advertising design. But the machine and the things it multiplied were still outside the artistic field. This did not prevent faculties and promoters from adopting the name "school of industrial art." And so the country has almost countless institutions in which the alliance of art and industry is claimed by name: yet from them the one typical industrial tool, the machine, is actually excluded. What we have treated of as industrial design in this book simply is not recognized at these schools.

A study of the industrial-art courses leaves one not only amazed that educators could so miss the significance of the machine-art development, but convinced that the training offered is likely to be more detrimental than helpful to any student looking toward service in the industrial world. Instruction on paper in advertising and fashion drawing, and training in stage decoration, costuming, and poster making induce just that two-dimensional

approach and consciousness which the machine-arts idea negates. They have to do with art laid on, not built in.

Several of the seasoned industrial designers have pointed out the inconsistencies of the offered "education in design," and a few have attempted to leaven the training by giving courses emphasizing the special values of design intended for the machine. Mostly they have given up the attempt as a bad job—useless as long as the school remains on a handicraft foundation, and holds to a manual-age philosophy.

Kem Weber has summed up the case thus: "Drawing is not design. Art schools give only secondary requirements to the designer, and knowledge of materials and machine tools is more important. . . . To be too handy with pencil and brush has a tendency to fool the draftsman or painter into believing that the article when produced must have the beauty of his drawing or painting."

The difficulty in the way of transforming the older industrial-art school into an industrial-design school is illuminatingly illustrated by the experience of the Association of Arts and Industries, in Chicago. Its organizers raised a sum of money to try out the idea of training students specifically for machine-industry design. The leading local art school already had certain of the needed facilities, and an agreement was made to the effect that it would establish a true industrial-design department. Immediately a pottery kiln, woodworking benches, and a printing press were installed, but aside from these marginally important features, the academic faculty turned back from workshop to studio design and paper problems. After three years of timid advance and retreat, the effort to be machine-minded had become so feeble that the Association of Arts and Industries withdrew from the arrangement and, in 1936, set to work to plan its own independent school.

The experience is typical of that of every pioneer advocate of courses specifically devoted to the fundamentals of industrial design. The conclusion

is that it will probably be easier to found wholly new schools of industrial design than to bring existent art schools to a realization of the importance of the machine element. It would seem an axiom: once an arts and crafts school, always an arts and crafts school—with no recognition of the change in life around. It is equally easy to dismiss from consideration the trade schools, since they exhibit as fundamental a lack on the other side, making no pretense of teaching art principles along with their technological training.

The failure of a true industrial-arts school curriculum to emerge in Chicago is doubly interesting because down the street at least two great mercantile firms controlling extensive factories have had difficulty in finding designers with the dual artistic-technological preparation of which they are in need. The Montgomery Ward organization, now in process of redesigning the major part of its merchandise, has arrived at a policy of building a permanent staff of artists who have an architectural or engineering education, after experimenting with the general run of free-lance designers and finding the results unsatisfactory. Sears Roebuck and Company, according to A. J. Snow, Director of the Design Department, "are constantly on the alert to find talent with sufficient design promise to merit employment."

What should the industrial-design school offer the student to prepare him for such opportunities? If no precedent for the properly balanced training is to be found in America, are there prototypes in Europe of the new centers we foresee?

The first requisite would seem to be opportunity for workshop practice, with work experience at actual machines, in combination with the long theoretical and evocative training now given at the best fine-arts schools. Training in all the branches of abstract and representative design on the one hand; experience in art geared to industry as it is, on the other. This means at the least, in the faculty, as many mechanics and engineers as fine-arts instructors.

Essentially such provisions will tend to develop into a community of students, artists, and technicians, with a full complement of meeting places and study places in the nature of studios, laboratories, and machine shops. The communal element is important: less of the old teacher-pupil relationship and less of the handing down of information, with more of working out projects together.

At the beginning the student will have certain elementary requirements which later will be taken care of as prerequisites. Ultimately all grammar- and high-school students in America will certainly be given what is known in the Soviet system as "polytechnical" training; that is, the student will learn by direct contact the feel and special capabilities of all basic materials—wood, metals, plastics, stone, glass, textiles, paper—and of all common tools and type machines and the simpler productive processes. But at first it will have to be especially provided for the student we are discussing, as preface to experiment in creative design; to the end that he may know how to use structural and industrial materials in their essential capabilities and limitations, and may know the limitations of the factory's machines in relationship to materials and certain elements of design. This polytechnical preparation, basic to any true knowledge of the modern machine-implemented world, will mean experience of the arts and industries in a sense unknown in our present intellectualized curriculum.

The Bauhaus in Germany was for a few years a living example of the institution we are talking about when we say that studio and shop should be united, that creative artist and machine technician should jointly train the student. Significantly it was planned and founded by a group of artists and architects, and it was they who brought about the alliance with mechanized industry. But they had widened their view of art to embrace the machine. In the words of the director, Walter Gropius "the Bauhaus accepted the machine as the essentially modern vehicle of form, and sought to come to

terms with it. Its workshops were really laboratories in which practical designs for present-day goods were conscientiously worked out as models for mass production."

Physically the Bauhaus was designed to breathe forth the atmosphere of Modern functionalist art, in exterior and interior architectural idiom, and in furnishing and equipment. Students were impressed immediately and continuously, by the environment, with the engineering element as a basis for design in the power age. Subtly and subconsciously they were imbued with a sense of honesty and directness in expression. They lived in a new world separated visually from that of the manual age: actually lived, for the dormitories were of the same architecture as classrooms and shops.

Any institution in America seriously undertaking to meet educational requirements in this field will similarly, we must believe, accept the basic engineering atmosphere, the functionalist aspect, as proper and natural beginning point for the fulfillment of the vision of a school of machine-age design. The shops equipped with machines would otherwise afford a certain appearance of incongruity. That architects of the proven ability of Neutra and Lescaze could acceptably express the joining of art and industry, in school buildings, we need have no doubt. It may be added in this connection that Kiesler has even drawn up a sample plan for an American school of industrial design.

We may trust the artists and collaborators to specify what sorts of rooms and furnishings, and libraries and galleries and stages will be necessary. But the machines which are fundamental will doubtless have to be fought over, being the elements not hitherto introduced into art education. It is obvious that the student will never find within school walls the full set of powered tools and assembly complexes for which he will later design, in such variant directions as metal products, glass, textiles, plastics, enamels, and travel and heavy industrial machines. A great deal will always have to be learned by

visits to neighboring factories, where mill processes and the assembly line can be seen in a complexity not possible in a laboratory. (This is argument for placing the first schools in or near generalized industrial centers, New York, or Pittsburgh, Detroit, Chicago, or San Francisco.) But machinery demonstrating shaping operations and finishing processes certainly is possible: from the range, say, of metal shaping instruments by pressing, spinning, and stamping, and in the nature of drills, lathes, and surfacing and polishing tools.

What is important is that, in addition to obtaining the feel of basic materials through direct handling, the student will have enough experience in operating actual machines to realize *the effect of machine technology on form.* If he goes little beyond the point where pattern making stops and duplicating-machine processes begin, he still will be in a position incomparably superior to that of the present-day industrial designers who were given their training largely on paper.

In stressing the architectural and shop side of the picture, as against the design-studio side, we take for granted that the other side, that of classroom and studio, will be adequately represented, out of traditional American experience.

It is significant that at the Bauhaus in the early years technicians and artists were equally balanced in the personnel. Each studio or shop group was under the direction of two "masters," one an experienced artist, the other a practicing mechanic or technician. The Germany of that day was as lacking in the dual product as is the America of today. Only toward the end of the Dessau experiment were men graduated who seemed fitted by the dual training to preside singly over industrial-design workshop and student group. Certainly in the early American experiments instruction and leadership are going to be needed from both sides at once, from professional artists and from engineers and machine tenders.

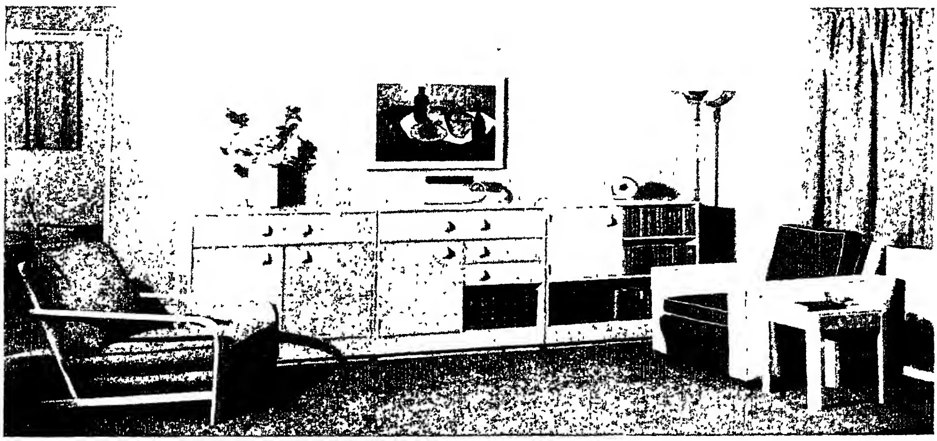
The artist needed to train—or shall we say supervise?—the industrial-

design student in the creative processes is not, we believe, to be visualized as a typical professor of fine arts. Courses in drawing and reproductive painting under one of the traditional realistic masters would be less than useful. What *can* be imparted of the mysterious creative processes, to evoke expression in painting, sculpture, and constructive visual design, is much more likely to come from association with men leaning toward abstract art: an Archipenko in sculpture, a Hans Hofmann in painting. It was from the Cubists, Purists, and Constructivists that one main channel of influence flowed, in the training of the present-day group of industrial designers. It is likely that the inheritors from those groups of abstract Expressionists will have most to give to the next generation of industrial designers. There is evidence again from the Bauhaus. There three of the world's leading abstractionist painters were among the supervisors: Kandinsky, Klee, and Feininger.

This problem of contemporary American education, primarily one of allying artist with engineer and mechanic, can be solved only through planning with regard to industry's needs. To conserve the young artist's design talent is the first educational objective, but the test of the training will be the fitness of the graduate to function effectively within the industrial complex. Certainly no curriculum or personnel or plan for equipment can be worked out by artists and educators without collaboration from manufacturing industrialists on the basis of their requirements.

The designers in America have been quick to acknowledge the importance of the realistic view. The Design Laboratory in New York, a sort of preschool in this field, organized under the direction of Gilbert Rohde, places special emphasis upon the coordination of design and marketing. The announcement reads:

"Created to supply a hitherto unfulfilled and pressing need in America, the school emphasizes coordination in the study of aesthetics, industrial products, machine fabrication, and merchandising. . . . Emerging from a

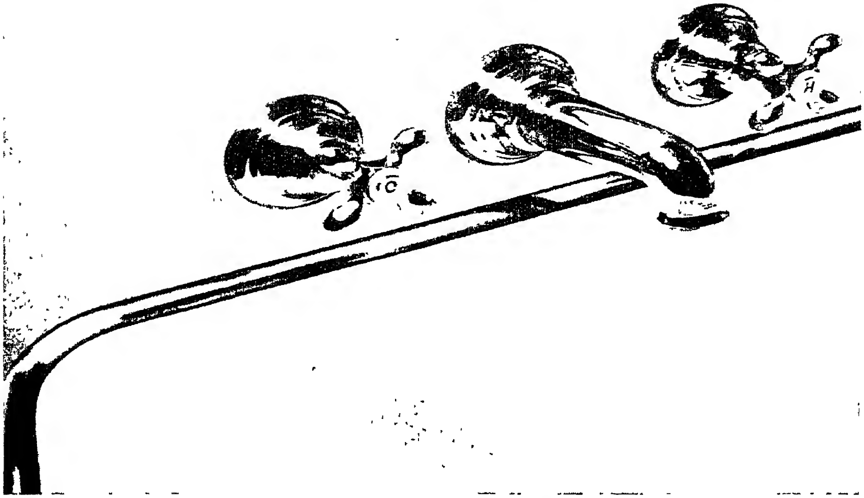


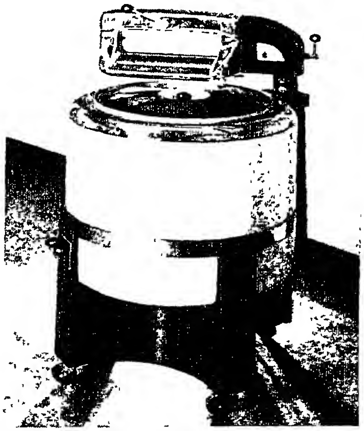
Above, the indoor-outdoor school, an experimental building by Richard J. Neutra for the Board of Education, Bell, California; below, a demonstration room by Gilbert Rohde to exhibit his low-cost mass-produced furniture for the Kroehler Manufacturing Company.

modern technique of living, all design, whether for ash trays or railway trains, must synthesize to the utmost, beauty, function, fabrication, and salability."

Nevertheless, some of the experienced designers who are strongest in advocacy of a foundation within industry's demands, and most impatient of a theoretical approach, stress the need for *sound art training first.* Montgomery Ferar has written: "The idea of specialized training for the industrial designer of tomorrow should begin undoubtedly with the aesthetic approach. Once the fundamental mental habits of the artist are ingrained into the student (and this is usually a long process) he can then be exposed to the limitations which will be put on his imagination by practical and engineering production methods. This fresh outlook and freedom from routine practice will and has aided the industrial designer in solving difficult engineering problems. A knowledge of merchandising and business organization is also essential. But to start the training of the designer with engineering and business practice would be a grievous error, and no amount of later aesthetic training could counterbalance the limitations imposed upon the student's creative processes during this early and formative period. At least it has been our experience that men accustomed to the analytical and thought processes of practical engineering are at a definite loss at understanding an aesthetic problem."

The balance of emphasis on the two fundamentals is found in statements by Harold Van Doren, who stresses the necessity for technological and engineering instruction, only to add that these are "useless without previous training in painting, architecture, and free design." Kem Weber, although he begins with the practical statement that "training of designers for industry must have the requirements of industry as its base," goes on to say that the more intangible elements of art education—not as currently dispensed in the art schools—are equally fundamental. Aesthetics and psychology stand high





Above, bathtub head designed by George Sakier, for Accessories, Inc.; below, washing machine by Henry Dreyfuss, for Associated Merchandizing Association.

on his list of required subjects, and of course the more obvious exercises in form and color design, and direct experience of materials and tools.

The one school in America that can claim to have made measurable progress, of a professional standard, toward training of industrial designers in the new sense is the Department of Painting and Design of the Carnegie Institute of Technology, in Pittsburgh. The specialized work there was initiated several years ago by Alexander Kostellow and Donald Dohner. The former still continues in his place as Associate Professor, and he has been joined on the faculty by Peter Müller-Munk, also a recognized practical designer. The Industrial Design section in 1936 graduated its first class, granting degrees to five students.

By utilizing on the one hand the special facilities of the College of Fine Arts (of which it is officially a part), and on the other those of the Institute's College of Engineering, the instructors have been able to afford the students —essentially and properly *art* students at the start—the dual experience of creative design methods and of machine processes. Further direct contact with factory activities is provided through visits to neighboring manufacturing plants. The curriculum for the first year is exactly that of other sections of the Department of Painting and Design; which is to say that the student is not asked to elect Industrial Design (over Painting or Two-dimensional Design) until the beginning of his second year of studies. Only in the third and fourth years does he devote the major portion of his time to such specialized courses as production methods, industrial processes, and model making.

The Carnegie course seems to have been wisely planned, and the Institute has facilities and endowment which may enable it to build up America's first thoroughly equipped center for the training of machine-conscious artists. The preparation and progress so far have been slow and methodical: with no effort to duplicate, for instance, so outstanding and spectacular an institution as was the Bauhaus. Perhaps the safest progress lies

in such gradual specialization, rather than in the immediate and unprecedented launching of separate institutions like the German one. There are authorities who have distrusted from the start the enthusiasm over and the radicalism of the Bauhaus.

Wisely the Carnegie pioneers have tried to afford the students a rather broad background education, along with the special training in art and industrial methods. W. A. Readio, Chairman of the Department of Painting and Design, has written:

"The prime aim is to assist the student in thinking of form in terms of the production factors of materials and tools. The student deals with a great many more product designs than can be carried out in his limited time here. This is essential, inasmuch as we would like to evolve a response to diversified situations.

"The question of 'how much specialization' is one to which we are endeavoring to give a long-term rather than a short-term answer. . . . Perhaps the student who knows as much as a school can give him about a single industry may have the advantage on his first venture into the world. However, our experience in other fields would seem to indicate that the student who comes with a well-developed technique of learning, reinforced with a background of how to apply the knowledge to the creative demands of the particular situation, will in the long run be able to fit himself effectively into a variety of situations. This should make for a better adjustment between the individual and a rapidly changing world. Certainly one cannot teach adaptability, but it may be possible to evoke and develop it. In any case that is our attitude in trying to train designers for industry."

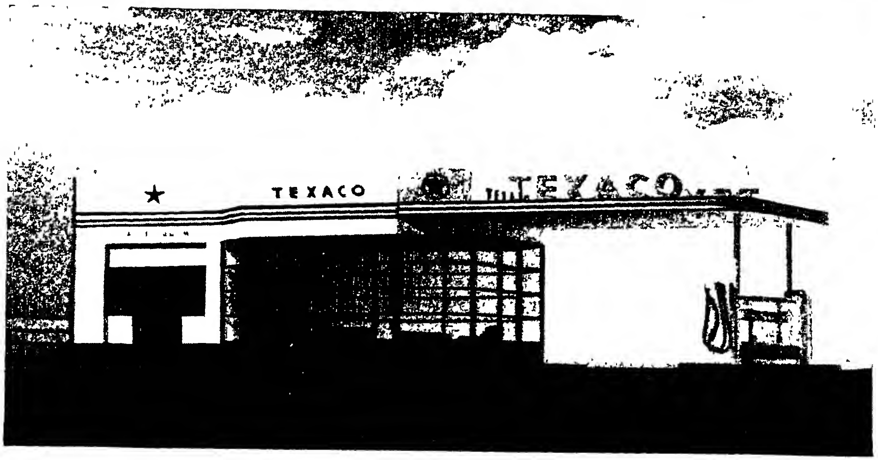
At the opposite pole from the Pittsburgh school experiment, and notable for its attempt to develop free creative effort through communal experience and through contact with outstanding creative designers, is the Taliesin Fellowship established at Spring Green, Wisconsin, by Frank Lloyd

Wright. By practice of building and through personal contact with an architect-genius, students are acquiring an education in architecture and the immediately allied arts, of a quality and breadth elsewhere unknown. The points at which the project fails of being the school community herein suggested are to be found in the purposely remote locale, away from cities, and in the modified emphasis upon machine influence. Wright was the earliest prophet of an art based on the machine tool as "peerless instrument," but Taliesin so far illustrates the balance turned a little less to the side of design for mass production and more to individual and specialized crafts. The machine being the factor almost totally overlooked so far in art education, the present writers would like to see schools in which that is emphasized, at first even overemphasized, to restore the lost balance.

There are lessons learned at Antioch College and Bennington College, and in the studios of the Cranbrook Foundation, which are of collateral interest and significance. At Black Mountain College in North Carolina Josef Albers, a graduate and later a "master" of the Bauhaus, is teaching in new ways, out of a vision and logic of machine-age design—and finding an extraordinary response. But this too is an experiment not fulfilling the specifications of a school primarily for professional industrial designers. It looks to a leavening of "general" education.

From two other directions there are indications that school people are somewhat awakening to the need for the dual artistic-technological training. The Case School of Applied Science, for instance, offers a course in Design and Appearance to its engineering students; but it is optional and therefore not to be interpreted as a sign of great conviction about the job of developing professional industrial designers. The Massachusetts Institute of Technology similarly has tried to broaden some of its architectural courses to include industrial design, but has not yet recognized the necessity for going farther.

At the other extreme Pratt Institute in Brooklyn, long a feeder of art



Abstract and machine elements expressed in home and commercial architecture. Above, the "All Electric House," Hollywood, California, designed by Richard J. Neutra, with Gregory Ain as associate; below, adaptable gasoline filling station, designed by Walter Dorwin Teague for the Texas Company.

teachers to widely scattered school systems, has put in a tentative course for designers looking toward machined industry, and has recently called in as instructor Donald Dohner, one of the few professional artists equipped to teach both requirements. Kem Weber has done similar teaching in California. Several times other of the leading industrial designers have gone into museum and art-school classrooms to pioneer with lectures and demonstrations. This may all be considered, however, marginal effort and tentative sounding.

And, indeed, to the student's question, "Where *can* I find training in the two fundamentals, art and technology?" there is considerably less than a satisfactory answer. Hundreds, possibly thousands, of art students see industrial design as the most vital and socially effective art of today and tomorrow—and, too, the most promising profession. How are they to fit themselves to answer the call of the executives who say they cannot find artists adequately prepared for their eminently practical but artist-dependent design departments? Where are they to develop the talent and gain the knowledge that might put them beside Dreyfuss and Geddes and Loewy as free-lance practitioners in this emergent profession?

The less than satisfactory answer is that just one school in America offers the dual training; that occasionally the established designers take in apprentices; that a number of colleges and universities seem on the verge of recognizing the importance of machine-conditioned design, and *may* establish schools with equipment and standards and vision this season or next. An architectural college, seeing its own subject merging into industrial design in the larger sense, might abandon the old decorative approach and afford training perfectly calculated to prepare the student in both art and engineering. But most of this is after all in the realm of might be and may be.

The school which is needed by the American student and by American industry, which is foreseen by artist and manufacturer alike, is, except for the Pittsburgh beginning, yet to be planned and opened. It will be, perhaps,

the most typical school of the technological era into which man is entering. It should be constructed without the cramping and compromise and lukewarm tolerance which are apparent in most of the effort so far.

This is, of course, a magnificent opportunity for some donor, preferably one with a fortune out of industry, a Ford or a Firestone or a Mellon, to serve his people and his time uniquely and importantly. It is opportunity to serve at once art and common living. Perhaps, however, the trial will have to wait upon approval by the great educational foundations. All that is certain is the need; and behind that the new way of life that the machine has brought.

If the young men who are to be tomorrow's industrial designers are to serve industry and the community soundly and practically, they must be artists not in the sense that art is precious and other-worldly but as bringing formal values to everyday useful products. Art knowledge and creative inspiration are their first materials, but their feet must be on the solid ground of the manufacturer's world. It is going to be their function to create the art that goes into every man's home—often by the back door. For that, they will need to coordinate their aesthetics with engineering and mechanics and merchandising. A proper school will serve to bring the student's ability to focus at the center of the complex which includes artist, industrialist, and consumer; studio, factory, and store.

Industrial-designed architecture seen between an "artistically" ornamented traffic signal and a decoratively treated building—a sign of the emergence of the new spirit. The seventy-story RCA Building in Rockefeller Center, New York City, New York.

13. TOWARD INTEGRATION

WE began by inviting the reader to consider design as the dominant and transforming fact of a twentieth-century visual environment. We went on to present the industrial designer as artist, as typical member of that citizenry which has been immemorially endowed with perception acute enough to sense aesthetic values in the common scene, plus the ability to isolate those values and make them a common cultural asset. His product, industrial design, we have regarded as a new space art based upon mechanical facts and functional motifs, an art of "cogs, cams, and crankshafts," ball bearings, spiral springs, dynamos and turbines, superpower plants, and steel silos.

The thrilling new beauty of factory-produced commodities for ordinary use, wherever they are adequately industrial-designed, has been offered as the most conspicuous evidence of a new world art. It is an art still in the primitive stages, and true to the laws of all primitive art, is everywhere manifested as secondary to the purpose of the thing designed. Egg beaters and inkwells, washing machines and air-conditioning mechanisms, railroad trains and motorcars: these delight the eye, arousing new wonder at the shaping power of the factory machine by their aesthetic values, which are conditioned upon their precise and efficient engineering.

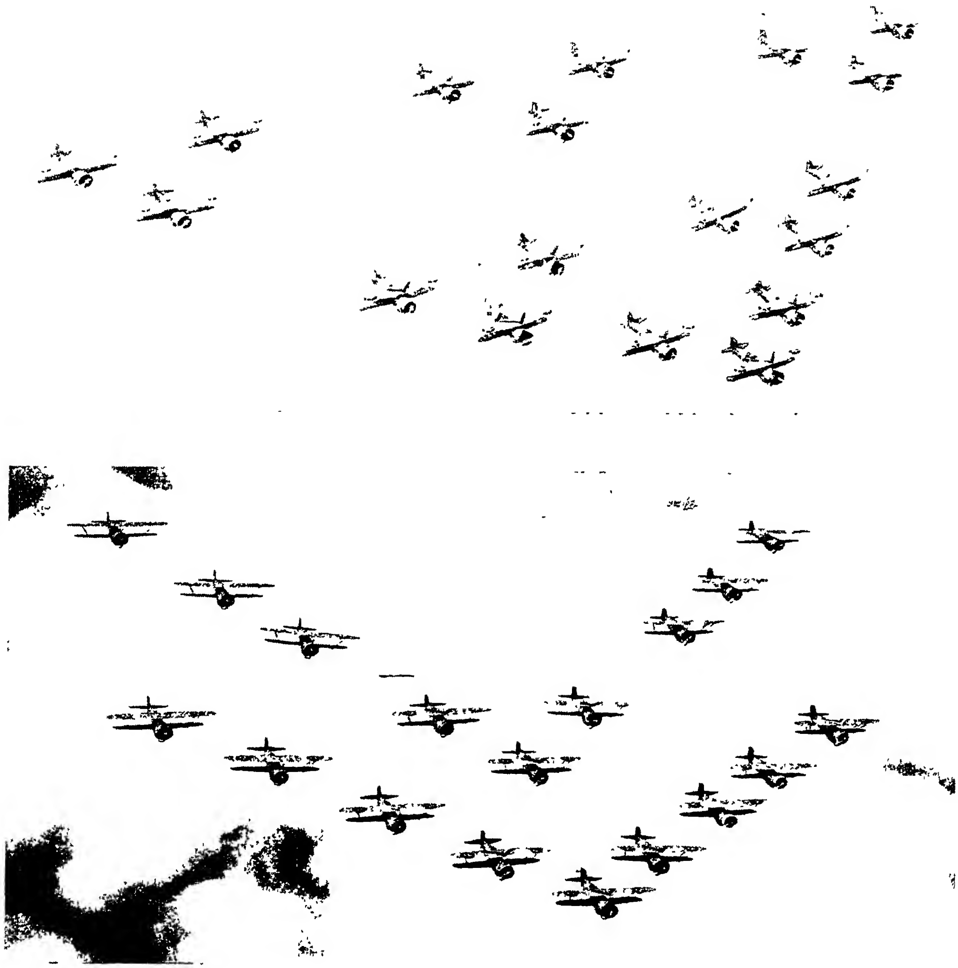
Products, designed or redesigned to meet this artist-technologist standard, as they become available in ever increasing variety and scope, offer themselves to the imagination as comprising adequate equipment to furnish and implement a gleaming machine-age world. Their unit and mass pattern, as they flow from the factories' assembly lines or as they are arranged in factory warehouses, contributes to the vision, illustrating the principle of repetition which is a fundamental of the mass-production process as well as of the engineering-art aesthetic. (The photography which is a direct product

of abstract art has made this principle familiar in studies of industrial-design products of all kinds, in lines of power machines in factories, in the orderly regimentation of raw materials for manufacture; just as it has helped educate the eye to demand the hard, smooth polished form and the sharp, cast shadow in all sorts of objects where hitherto a relief-like modeling and ornamentation of surfaces created broken patches of light and shade.)

There is another process by which industrial-design influence may be seen to pass from detail to organic entity, from object to environment. A chair or table designed by Gilbert Rohde, for instance, fails to become completely expressive until it is made part of an integrated interior-design scheme by the same artist or by another artist with the same formal conception of machine-age design. A bus redesigned by Raymond Loewy leads to the adoption of a complete redesign program for the rolling stock of a transcontinental line, and subsequently to the designing of a chain of passenger terminals. A vacation house in the Pennsylvania hills becomes the starting point for a complete summer community unit designed by William Lescaze.

Modern architecture, organically conceived, and the new interior architecture, have been shown as products of the machine-age principles and processes that produce smaller industrial design. It remains to be shown that industrial design in all these aspects is but one manifestation of a dual economic-aesthetic activity that is apparent throughout social and economic life in the United States; and to show at how many places evidences of the machine-age visual environment are already emergent.

A chance airplane view sometimes reveals the design integrity of a community or a region, as presenting the appearance of an abstract and formal art composition. On a background of green, a prevailing system of geometrical lines, hard and white, represents the major traffic system, in contrast with which there are informal lanes running through broad reaches of parks and at watersides. There are industrial, recreational, and civic centers within the



Machine-age repetition as a new source of abstract geometric patterning—airplanes in flight formations. *(Official U. S. Navy photographs, by courtesy of the Aeronautical Chamber of Commerce.)*

major composition, each with a dominant architectural character of its own.

Longview, Wash., an industrial town conceived whole and built according to a detailed artist-technologist design, represents such an organic appearance; or Kingsport, Tenn., a model municipality designed and developed by a railroad company in need of more patronage from a sparsely populated region. Then there is Radburn, N.J., the most advanced example of combined social science, land and building economics, and aesthetic practice, and the closest approach to an Engish garden city adapted to contemporary American conditions (although the individual buildings still reflect Eclectic thinking). There are some Federal Government design schemes of broad scale representing advances in the theory and practice of integrated planning. They include planned towns in the principal power-development areas, subsistence-farm and homestead planning, and (in collaboration with municipalities) large-acreage, low-cost housing projects.

The "clover-leaf" safety intersections on superhighways are one of the details which illustrate the intellectual and mathematical basis of broadly conceived land-planning schemes, to which cities and entire regions are being progressively submitted. The play-area group at Jones Beach on the Atlantic Coast, and some of the Los Angeles public playgrounds overlooking the Pacific, are others. There are certain replanned industrial centers, for instance the cotton mills at LaPlante, Ga., with their factories and parks and blocks of workers' houses demonstrating even more triumphantly the drastic logic of artist-technologist design.

Specialists in landscape engineering, regional, community, and industrial-center planning, and architecture all work together in the broader undertaking to produce the same trinity for which the industrial designer works, efficiency, economy, and beauty. Their materials, however, are the whole outdoors and their designs in space alter entire landscapes. They form new horizons which are appropriate backgrounds for the specific machine-age

Abstract values capitalized in industrially designed architecture. Stairway to roof, week-end house, Southport, Long Island. A. Lawrence Kocher and Albert Frey, architects.

products we have been analyzing. The same preliminary activities underlie these larger efforts. Research is concentrated, however, not upon merchandising cycles and consumer demand, but has to do with broad problems in the economics of land use: population movements, the science of traffic planning for present and future, right ratios between buildings and the spaces surrounding them and better building groups and protected open areas. Civic, governmental, and commercial interests are usually inseparable in the longtime programming involved. As in the case of industrial design, the nature of the effort is fundamentally a taking advantage of the most advanced technological means available, for the undoing of industry's early mistakes.

Systems of streets and highways, unified traffic and transportation routes, local and regional parks and recreation areas, heavy industrial districts appropriately located in relation to protected residential units: in every part of the country these have been planned, and at least partially realized, individually or in broad programs, as antidotes to the nineteenth century's waste, destruction, and misuse of natural resources. They represent a new functional approach to designed living for whole populations, to be realized gradually as blighted areas, polluted streams, sweated land, and slums are corrected. Together they promise an environment of ordered parts, according to an ideal which we have seen implied in our advanced machine technology, and in instances of formal design based on function.

The designer of a cook spoon or cocktail shaker or drinking glass for manufacture in millions of examples, or of a streamlined train or a motorcar, appears logically enough as contributor in the vast movement which involves restudy of all constructions and commodities. Regional and community planning is merely functional-aesthetic design at another level. That the same kind of effort is involved may not be at first apparent. And yet it may be recalled that an industrial designer has produced inkwells and doorknobs at one end of the scale, and group houses and a summer community unit at

the other; and that the slogan of another designer is "everything from a match to a city."

Even before railway engineering executives began to say in their national conferences that the redesign of whole railways is necessary as a consequence of redesigned and streamlined trains, at least two industrial designers were working on problems of comprehensively planned railroadways, to permit fuller advantage being taken of high speeds realized through application of aerodynamic principles to locomotives and trains. One industrial designer, Richard Neutra, in a book on American city planning which was widely read in Europe several years ago, gravely reported that no railroad had yet built a complete system representing a unified aesthetic conception. Raymond Loewy has recently been commissioned by the municipal authorities of Atlantic City to redesign certain waterfront areas, for improvement of traffic and recreational facilities. Two well-known designers whose work has been discussed here in some detail are working separately on confidential commissions for important industries, each of which is studying for its workers advanced group-housing undertakings representative of scientific-aesthetic land use, including economically workable types of prefabricated building construction.

It is not our intention to suggest merely that the industrial designer's work tends to merge into these wider fields, but rather that there is a new subjective force active in the machine-age world, imposing itself upon the external environment as a spirit of order. It follows the same principles in the broader realm as in the already explored realm of industrial design. There is a common aesthetic throughout, an element suggesting a widely prevalent new world style.

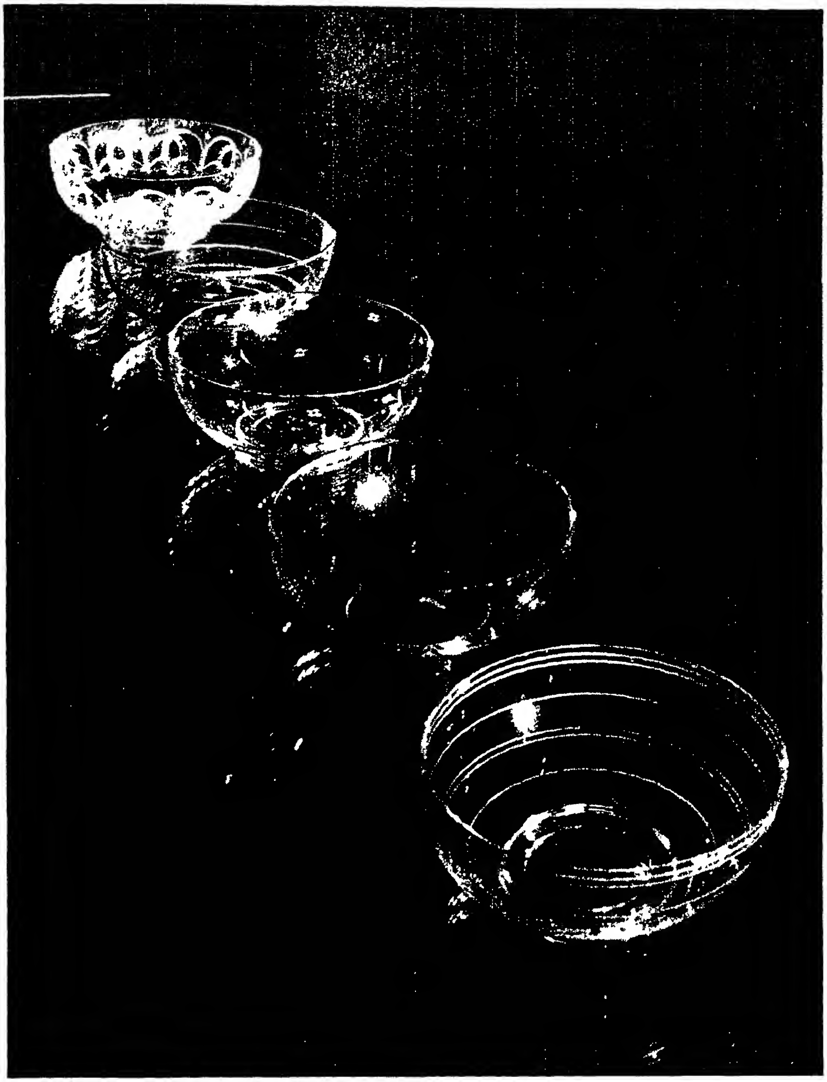
It seems worth while to note, parenthetically, that the permeative influence in the larger field goes beyond visual or appearance aspects. Dr. Edward R. Weidlein, Director of the Mellon Institute of Industrial Research,

recently wrote, in *The American City* magazine: "The indication seems clear that we are to get an effective impetus for city beautification from and by grace of machine production. We first expected the machine to give us utility. Then we asked that attention be given to artistry of form. Now we are demanding emphasis on highly polished surface and lavishness of fresh, bright color in addition to form and utility. The response is apparent in many modern creations which are winning public favor.

"The movement now well under way will challenge the old as it has never been challenged. To what length it will penetrate into our daily living conditions no one can say. But there is no doubt that the new form of beautification will require cleanliness, strong clear light, and complete freedom in the use of color, necessitating smoke and dirt control. We should probably be prepared to see control of noise and vibration added to the other amenities of the new age."

Henry Ford surmised as long ago as 1930 that odor and noise control would be among the major industrial gains following appearance design. Earnest Elmo Calkins, one of the prophets of the new order which artist-technologists are to establish, wrote in 1928: "In the next generation no one will be allowed to produce offense to eye, ear, or nose." The notable fact is that as inventions and improvements are employed for better utilities and for the better distribution of utilities in the broad environment, and the better design of mechanisms in the immediate environment, with some organic social and cultural ideal at least nebulously in the background, these further non-visual improvements tend to come automatically.

"Our need," Herbert Read has written (in *Art and Industry*), "is the wider recognition of art as a biological function, and a constructive planning of our modes of living which takes full cognizance of this function. In every practical activity the artist is necessary, to give form to material. An artist must plan the distribution of cities within a region; an artist must plan the



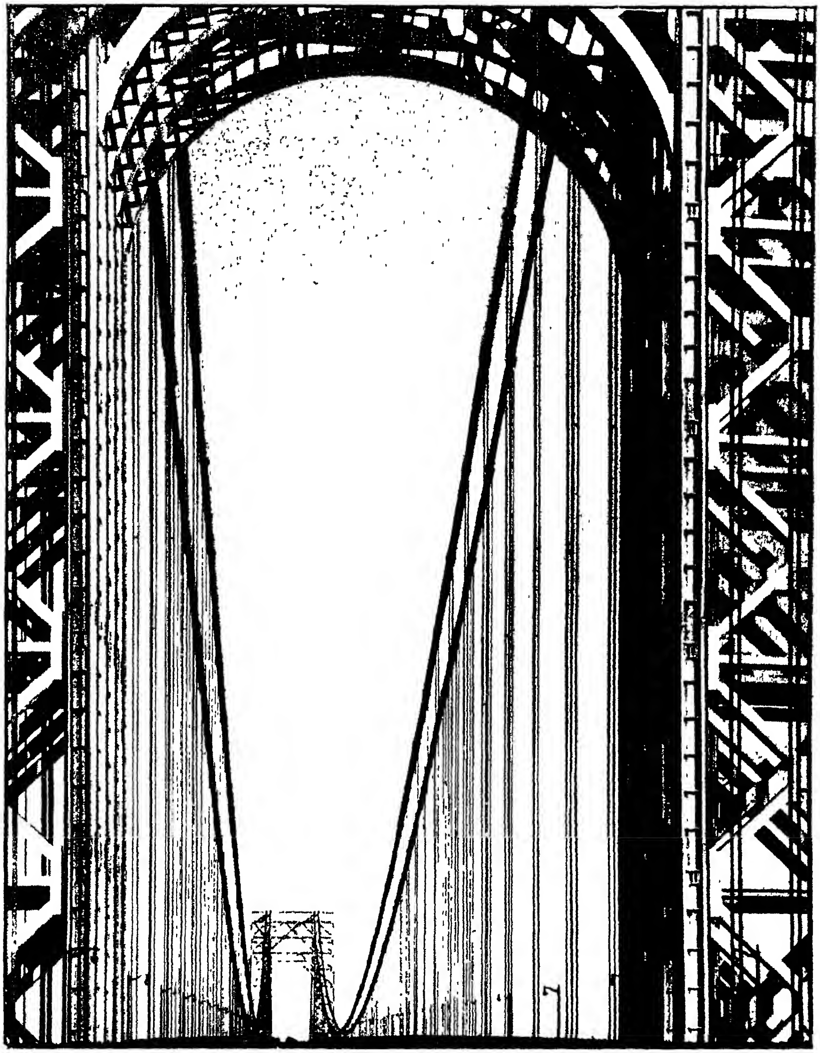
Mass-production glassware designed by George Sakier for the Fostoria Company. The industrial designer achieving machine-age distinction in some models while repeating older idioms in others.

distribution of buildings within a city; an artist must plan the homes themselves, the halls and factories and all that makes up the city; an artist must plan the interiors of such buildings—the shapes of the rooms, and their lighting and color; an artist must plan the furniture of those rooms down to the smallest detail, the knives and forks, the cups and saucers, and the door handles. And at every stage we need the abstract artist, who orders materials till they combine the highest degree of practical economy with the greatest measure of spiritual freedom."

The aesthetic common to the art in all these areas, constructions, furnishings, fittings, mechanisms, and accessories is statable in the same terms as that governing the contemporary industrial designer's output in a representative range of factory products:

Each designed unit is formed of materials required for its function. The designer's undertaking is to achieve an organic expression of that function. The elements of the functional design are utilized in new combinations and new relationships as the elements of the artist product, entering into the appearance values. To the extent that the designer is a creative artist he uses these elements intuitively, according to the same laws of composition which produce a painting or a sculpture. Always there is the stage at which material and logical design passes into the essentially unanalyzable region of pure form creation. The result is not a personal expression but the expression of a subjectively perceived form felt by the artist to be in harmony with some larger rhythm and order of the universe.

Historically, the broad industrial-design movement relates itself to brief periods when new technological proficiencies became the bases of new artist efforts and inventive-creative energies ran high, taking form in activities of consequence to large social groups, ushering in new eras. So it was that the great age of buildings and bridges came to Europe about the tenth century, with the unsurpassed plexus of artisan-craftsman arts of the Middle



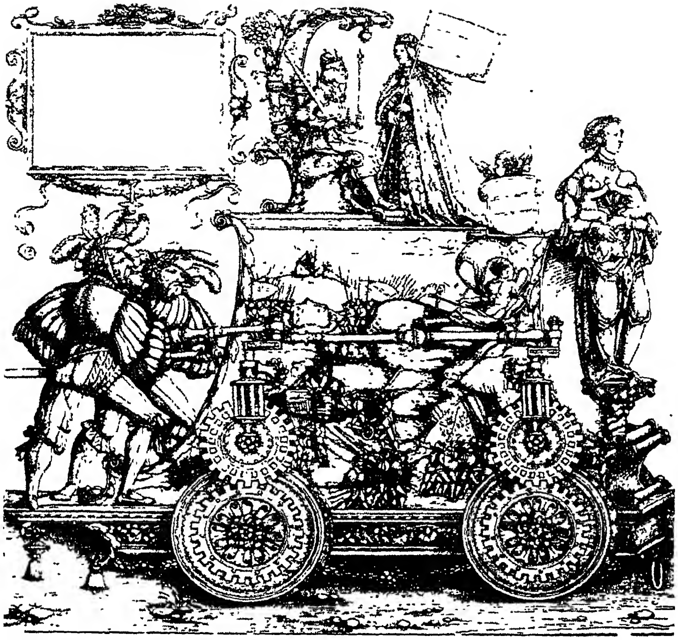
Bridges were among the earliest objects designed with conscious capitalization of the exciting engineering values. The George Washington Bridge over the Hudson River at New York City. *(Photograph by Margaret Bourke-White. By courtesy of the editors of Fortune.)*

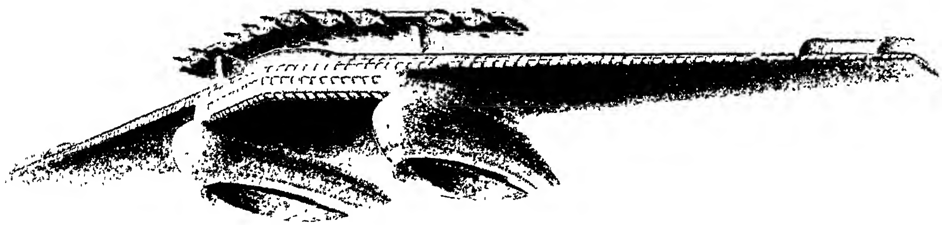
Ages following; so it was when those fifteenth-century experiments with eggs and domes gave characteristic form to Renaissance architecture and its subordinate arts.

If in the centuries between there has been no further phenomenal contribution to the history of creative achievement, it may be because evolving industrial-design effort moves in successively larger and slower cycles. Machine influence, as it has been developing since the eighteenth century, is, thus seen, a civilizing force of unparalleled scope, and correspondingly slow in producing cultural consequences. The scale on which the forces of physical nature are being brought into subjection to human nature, by the machine, suggests that the full significance of our own period as seed bearer of new arts may not appear for another half century, while meantime, we may expect, the characteristic outlines of the machine-age world will have taken on definitive form.

That is why there appears to us so rousing a challenge to the average person to follow the lure of the new world style, from his latest purchase of a useful gadget to where it reappears in a hundred forms on constantly widening horizons. He seems to us to stand with the contemporary designer on a wider rim of the evolutionary spiral, corresponding exactly with that of the makers of the medieval German Household Book, or Schedel's Cosmography, or with that of the succeeding age-of-science figures of Leonardo and Dürer, and the small, enthusiastic public of both—which shared in the spectacle of new cultural eras taking on familiar form in the common environment. The only difference is that those makers of pictorial encyclopedias were illustrating periods when technical advances, though sped up to the point of producing striking visual transformations, were within the field of handicrafts; whereas today the change is in the nature of an all-embracing revolution, from handicraft to machine craft.

Because there is a tendency, even on the part of some industrial





Prophetic visualizations, 1515 and 1929. Albert Durer's "automobile" for Emperor Maximilian and Norman Bel Geddes' design for a luxury plane to carry 606 persons.

designers, to view the contemporary manifestation as a commercial expedient comparable with former waves of style and design effort by merchandisers, the historic parallel may be pursued further: those great masters of the history of drawing, who were themselves artisans and craftsmen of the first order, were also creators and prophets. Working at their trades they produced useful things, but they also made prophetic visualizations, some of them embodying ideas which we are only today putting into practical use. There were Dürer's "automobile," and Leonardo's flying machine; and there were scores of other men and other comparable conceptions, some for centuries passing as humor. Recalling them, we feel more open-mindedly receptive to the designs and the visualizations which are entirely outside the orderly evolution of contemporary industrial practice and consumer acceptance, examples of which we see increasingly in certain periodicals and in modern design exhibitions. Knowing what has been, we more boldly contemplate the vision of what conceivably is to be.

And yet there is evidence enough of accomplished revolution all about us. Perhaps never before in the history of the world in a like period, or in any period, has the visual environment undergone so great a willed change as that of the American scene since the mid-twenties. The machine-determined, artist-aided transformation has already made itself felt in the lives of every family and every individual in the nation.

The eye is dazzled; the sense of wonder is aroused and stimulated. Cubes, disks, cylinders, spheres, and other constants of universal mathematics loom along familiar horizons in new buildings. Chromium, copper, steel, and glass are among the materials that glitter and glow, amid black and white sculptured forms of steel-supported concrete skyscrapers. There are structures among them that till yesterday had no names and would have been useless: airports, radio towers, dirigible hangars, superpower plants, planetariums. The most perfect objectification of safe and efficient speed

hovers above, in the new airplanes. There are a few homes that have been made organic, adaptable compositions of living space, designed around a highly mechanized central core, representing everyday intimate existence at a new level of efficiency and reposefulness. In these homes, and in many others (because smaller objects and accessories are more readibly responsive to fresh conceptions of design), kitchen fittings, bathroom furnishings, table accessories, are alike endowed with the new integrity of form. Gradually the pervasive atmosphere of formal design spreads outward and becomes visible (though still too rarely) throughout the community.

Already we can glimpse the community of tomorrow as a place unified and harmonious: an industrially designed machine-age entity. Its considered patterning of buildings and spaces, its landscaping public and private, are a coming realization of the universal utility of the machine as dreamed by the boldest of the nineteenth-century industrial pioneers, and as transubstantiated by the boldest of the pioneering abstract artists: the industrial designers. It is the emergent product of the twentieth-century industrial pioneers: a new American scene, coordinated, artist-determined, machine-realized.

BIBLIOGRAPHY

IN preparing a bibliography, the authors have had to meet the difficulty that American writers have not hitherto made a clear separation of machine-determined industrial design from the handicrafts and "applied" arts. The available books may be said, therefore, to attack the subject at one or another point—dealing with history, aesthetics, or current trade practice—without coming to grips with the whole complex of factors. In general the British writers have been broader in their approach, but they deal with a set of conditions different from the American. Nevertheless, the ten volumes here listed with descriptions will be found to afford varied and valuable light upon the subject. As a group they may be considered a basic library of modern industrial-design knowledge.

Art and Industry: The Principles of Industrial Design, by Herbert Read, Harcourt, Brace, New York, 1935. A scholarly work on the theory and practice of industrial design, with special reference to the English development. Written with insight into the special requirements due to the machine factor; but confused, and lapsing in many portions into descriptions of handicraft methods and ornamentation. Interestingly illustrated.

The Conquest of Ugliness: A Collection of Contemporary Views on the Place of Art in Industry, edited by John de la Valette, Methuen, London, 1935. Contains some excellent chapters or sections, among others not thought out from the machine-age viewpoint.

Horizons, by Norman Bel Geddes, Little, Brown, Boston, 1932. Theory and practice of industrial design in its first stages, as viewed by a leading practitioner, with case histories. The book is made more exciting by prophetic visualizations of future design, among the illustrations.

Industrial Design and the Future, by Geoffrey Holme, The Studio, London, 1934. A book containing valuable information in badly organized form; including many opinions from important persons, given in answer to an international questionnaire about the designer in industry. Usefully illustrated.

Machine Art, Museum of Modern Art, New York, 1934. Well-illustrated exhibition catalogue, with brief introductory essays. The standard work on beauty in functional machines, machine parts, and products, without reference to named artists.

Machine-made Leisure, by Paul T. Frankl, Harper, New York, 1932. Popularly written and suggestive chapters on the arts of design in contemporary life; combatting the current too facile "styling" and outlining firmer foundations for machine-age art. Unfortunately lacks illustrations.

Modern Architecture, by Frank Lloyd Wright, Princeton University Press, Princeton, 1931. Two chapters, "Machinery, Materials and Men," and "Style in Industry," contain important source material regarding industrial design. The balance treats suggestively the new architecture and community planning.

The New Architecture and the Bauhaus, by Walter Gropius, Faber & Faber, London, 1935. Excellent brief illustrated essay on machine-age architecture, and upon the organization and aims of the world's foremost experiment in industrial-design education.

The New Vision: From Material to Architecture, by Moholy-Nagy, Brewer, Warren & Putnam, New York, n.d. Valuable if somewhat vague book, by one of the "masters" of the Bauhaus, upon the materials and the philosophy of the arts, suggestive of the new approach to design; with remarkable illustrations.

Technics and Civilization, by Lewis Mumford, Harcourt, Brace, New York, 1934. The most important background book for industrial-design

students, treating the whole complex of social and technological factors historically and analytically. The chapter "Assimilation of the Machine" is also the soundest and most stimulating introduction to the cultural and aesthetic phases of the subject.

There are books that touch upon the subject at more isolated points, or treat particularly one part of the industrial-design field. The new machine-age architecture is described and analyzed in *The International Style: Architecture since 1922,* by Henry-Russell Hitchcock, Jr., and Philip Johnson (Norton, New York, 1932); and in *The New World Architecture,* by Sheldon Cheney (Longmans, Green, New York, 1930). These are perhaps the most useful introductory works; but see for further study the several books of LeCorbusier, and the very stimulating writings of Louis Sullivan and Frank Lloyd Wright. Useful as a more summary fact treatment, well illustrated, is *Modern Architects,* published by the Museum of Modern Art, New York, 1932, in connection with an exhibition.

In *Modern Swedish Decorative Art,* by Dr. Nils G. Wollin (Architectural Press, London, 1931) the distinction is well made between manual-art and machine-art aesthetic, but the book is almost exclusively about the handicrafts and applied arts. In America the books of Charles R. Richards are important in this transitional field. His *Art in Industry* (Macmillan, New York, 1929) offers the best index to the position of the artist in the several industries—particularly those dealing with costumes, textiles, jewelry, and furniture—but the applied-art viewpoint is evident. Ely Jacques Kahn's *Design in Art and Industry* (Scribner, New York, 1935) traces the history of design and craftsmanship in many countries and suggests a needed reorientation of American art education.

Over on the side of technology, industrial history, and economics, the following volumes will be found useful and suggestive: *Men and Machines,*

by Stuart Chase (Macmillan, New York, 1931); *Tools of Tomorrow,* by Jonathan Norton Leonard (Viking Press, New York, 1935); and *The Great Technology,* by Harold O. Rugg (John Day, New York, 1933).

Among periodicals, the one most nearly centered in the industrial-design field is *Creative Design* (New York, 1934 to date). Its files include treatment and illustrations of much of the best current work accomplished by recognized members of the new profession. Among specialized trade journals, *Modern Plastics* may be mentioned as outstanding in its attention to design problems and results. Nearly all the standard architectural journals carry departments devoted to industrial-design news and accomplishments.

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